Calculus 10th Edition Larson Test Bank

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# **Test Bank**

# Calculus

# **TENTH EDITION**

# Ron Larson

# **Bruce Edwards**



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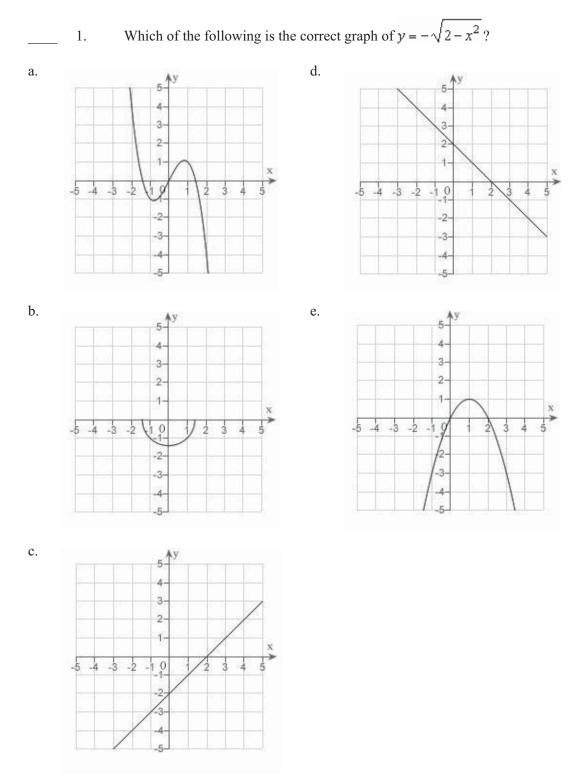
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## P.1 Graphs and Models

### Multiple Choice

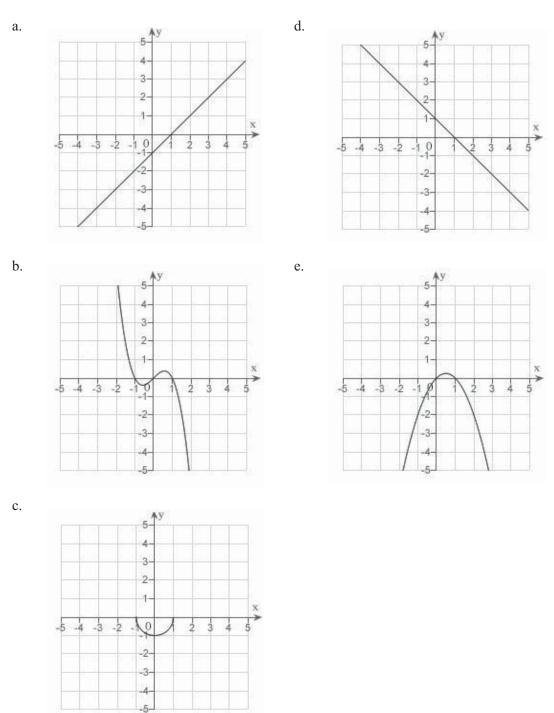
Identify the choice that best completes the statement or answers the question.



\_\_\_\_\_

2.

Which of the following is the correct graph of  $y = x - x^3$ ?



3. Find all intercepts:

$$y = x^2 - x - 12$$

- a. *x*-intercepts: (4,0), (-3,0); *y*-intercepts: (0, 4), (0, 3)
- b. *x*-intercept: (12, 0); *y*-intercepts: (0, 4), (0, 3)
- c. *x*-intercepts: (4, 0), (-3,0); *y*-intercept: (0, -12)
- d. x-intercepts: (4, 0), (-3,0); y-intercepts: (0, -12), (0, 12)
- e. *x*-intercept: (-3, 0); *y*-intercept: (0, -12)

\_\_\_\_\_ 4. Find all intercepts:

 $y = (x+5)\sqrt{4-x^2}$ 

- a. x-intercepts: (-5, 0), (-2, 0), (2, 0); y-intercepts: (0, 0), (0, 10)
- b. x-intercepts: (-5, 0), (2, 0); y-intercept: (0, 10)
- c. *x*-intercepts: (-5, 0), (2, 0); *y*-intercept: (0, -10)
- d. x-intercepts: (-5, 0), (-2, 0), (2, 0); y-intercept: (0, 10)
- e. x-intercepts: (-5, 0), (-2, 0), (2, 0); y-intercept: (0, -10)

5. Test for symmetry with respect to each axis and to the origin.

 $x^2y^2 = 8$ 

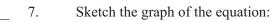
- a. symmetric with respect to the origin
- b. symmetric with respect to the *x*-axis
- c. symmetric with respect to the *y*-axis
- d. no symmetry
- e. A, B, and C

\_\_\_\_\_ 6.

Test for symmetry with respect to each axis and to the origin.

$$y = \frac{x^2 + 2}{x}$$

- a. symmetric with respect to the origin
- b. symmetric with respect to the *y*-axis
- c. symmetric with respect to the *x*-axis
- d. both B and C
- e. no symmetry



$$x = 4 - y^2$$

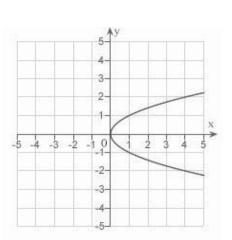
a.

b.

5

4

-3 -2 -1 0



43

5-

4-

3

2

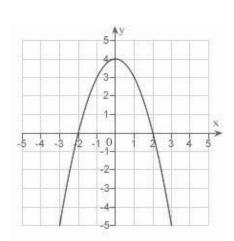
1.

-3-

4

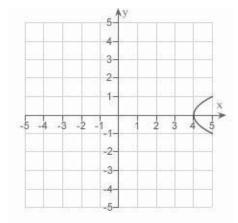
5

2

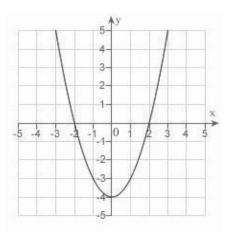




d.



c.



8. Sketch the graph of the equation:

$$y = |x + 2|$$

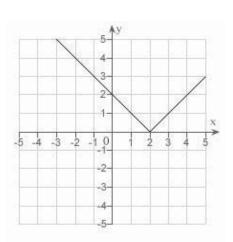
a.

b.

c.

-5 -4

-3 -2



5-4-3-

1-

0

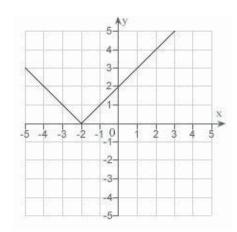
-2--3--4-

-1

2 3

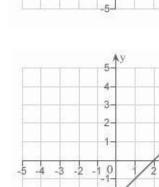
3

x



e. none of the above

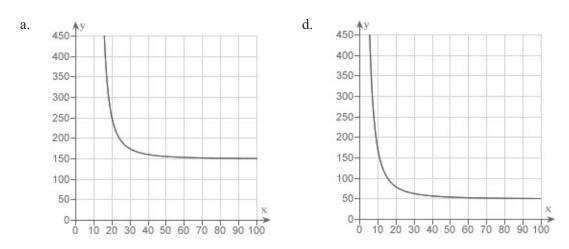
d.

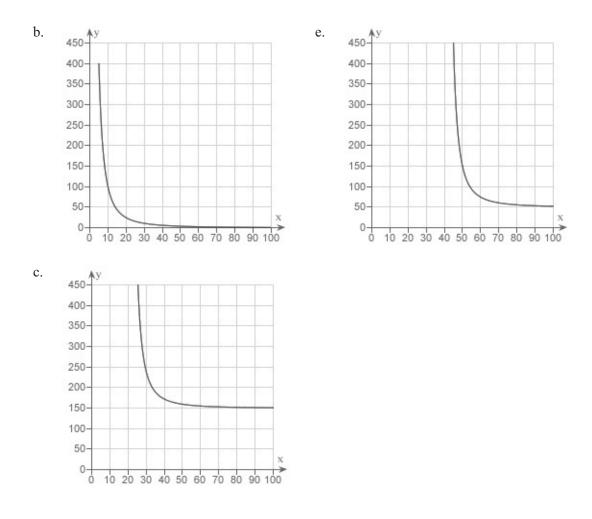


9. Find the points of intersection of the graphs of the equations:

 $x = y^{2} - 3$  y = x + 1a. (-2, 1), (-1, 2) b. (-2, 0), (1, 2) c. (-2, -1), (1, 2) d. (2, -1), (-1, 2) e. (-2, -3), (-1, 2)

10. The resistance y in ohms of 1000 feet of solid metal wire at  $77^{\circ}F$  can be approximated by the model  $y = \frac{10,000}{x^2} - 0.57, 5 \le x \le 100$ , where x is the diameter of the wire in mils (0.001 in). Use a graphing utility to graph the model  $y = \frac{10,000}{x^2} - 0.57, 5 \le x \le 100$ .





The resistance y in ohms of 1000 feet of solid metal wire at  $TT^{o}F$  can be 11. approximated by the model  $y = \frac{12,000}{x^2} - 0.46$ ,  $5 \le x \le 100$ , where x is the diameter of the wire in mils (0.001 in). If the diameter of the wire is doubled, the resistance is changed by approximately what factor? In determining your answer, you can ignore the constant -0.46.

- a. 1
- 2 b. 1
- 5 4 c.
- d. 5
- 1 e.
  - 4

12. Test for symmetry with respect to each axis and to the origin.

$$y = x^2 - 8$$

- a. symmetric with respect to the origin
- b. symmetric with respect to the *y*-axis
- c. symmetric with respect to the *x*-axis
- d. both B and C
- e. no symmetry

13. Test for symmetry with respect to each axis and to the origin.

## |y| - x = 6

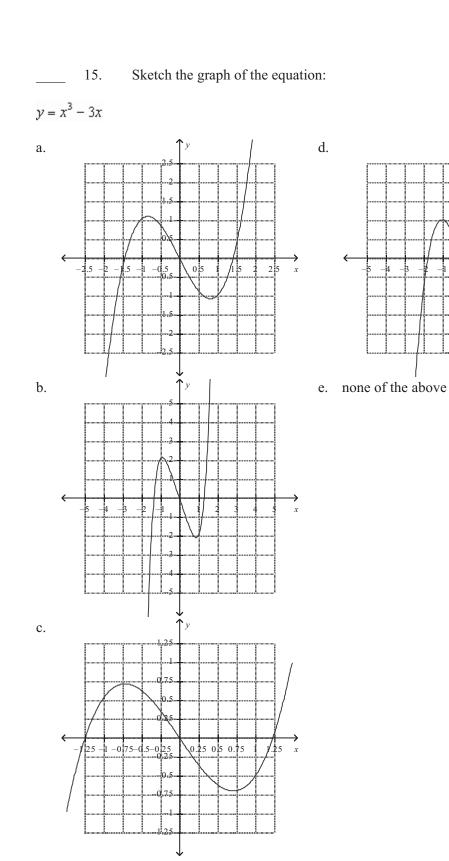
- a. symmetric with respect to the origin
- b. symmetric with respect to the *x*-axis
- c. symmetric with respect to the *y*-axis
- d. no symmetry
- e. A, B, and C

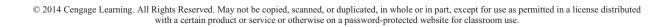
14. Find all intercepts:

# $y^2 = x^3 - 25x$

- a. *x*-intercepts: (0,0), (5,0), (-5,0); *y*-intercept: (0, -25)
- b. x-intercepts: (0,0), (5,0); y-intercept: (0, 0)
- c. *x*-intercepts: (0,0), (5,0), (-5,0); *y*-intercept: (0, 0)
- d. x-intercepts: (0,0), (5,0); y-intercept: (0, 5)
- e. x-intercepts: (0,0), (5,0), (25,0); y-intercept: (0, 0)

x





## P.1 Graphs and Models Answer Section

#### **MULTIPLE CHOICE**

1.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Identify the gr	aph of	a semicircle				MSC:	Skill
2.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Identify the gr	MSC:	Skill					
3.	ANS:	С	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Calculate the	intercej	ots of an equati	on			MSC:	Skill
4.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Calculate the	intercej	ots of an equati	on			MSC:	Skill
5.	ANS:	Е	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Identify the ty	pe of s	ymmetry of the	e graph	of an equation		MSC:	Skill
6.	ANS:	А	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Identify the ty	pe of s	ymmetry of the	e graph	of an equation		MSC:	Skill
7.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Graph a quad	atic eq	uation in y				MSC:	Skill
8.	ANS:	D	PTS:	1	DIF:	Med	REF:	Section 0.1
OBJ:	Graph an abso	olute va	lue equation				MSC:	Skill
9.	ANS:	С	PTS:	1	DIF:	Med	REF:	Section 0.1
OBJ:	Calculate the	points o		of the g	raphs of equation	ons	MSC:	Skill
10.	ANS:	В	PTS:	1	DIF:	Med	REF:	Section 0.1
OBJ:		model	using the capa	bilities	of a graphing u	itility	MSC:	Application
11.	ANS:	Е	PTS:	1	DIF:	Med	REF:	Section 0.1
OBJ:	Interpret a rati	ional m					MSC:	Application
12.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Identify the ty	pe of s	ymmetry of the	e graph	of an equation		MSC:	Skill
13.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	• •	pe of s	ymmetry of the	e graph	of an equation		MSC:	Skill
14.	ANS:	С	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Calculate the	MSC:	Skill					
15.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.1
OBJ:	Graph an equa	ation in	У				MSC:	Skill

## P.2 Linear Models and Rates of Change

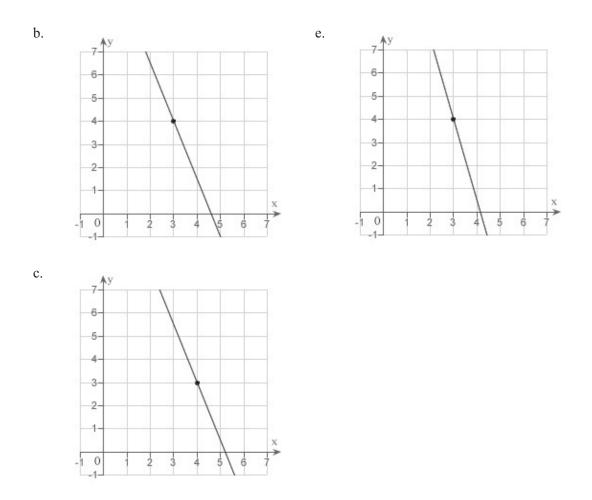
### **Multiple Choice**

Identify the choice that best completes the statement or answers the question.

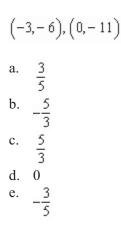
5 4 3 2 5 -4 -3 -2 þ 5 ż 2 -3-4 15 a. 3  $\frac{1}{3}$ b. <u>1</u> б c. d. 1 б 6 e. Sketch the line passing through the point (3, 4) with the slope  $-\frac{3}{2}$ . 2. d. a. 6 6--5 5 4 4 3. 3-2 2 1 1 х 0 ż 3 6 0 Ż 4 -1-

1. Estimate the slope of the line from the graph.

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3. Find the slope of the line passing through the pair of points.



4. Find the slope of the line passing through the points 
$$\left(-\frac{1}{8}, \frac{8}{3}\right)$$
 and  $\left(-\frac{3}{16}, \frac{1}{24}\right)$ .

- a. 63
- b. -21
- c. 42
- d. 21
- e. -42

If a line has slope m = -4 and passes through the point (4, 8), through which of the 5. following points does the line also pass?

- a. (1, 20)
- b. (1, 12)
- c. (1, 0)
- d. (8, -16)
- e. (8, -24)

A moving conveyor is built to rise 5 meters for every 7 meters of horizontal change. 6. Find the slope of the conveyor.

a. 0  $\frac{5}{7}$ b.  $\frac{7}{5}$  $-\frac{7}{5}$  $-\frac{5}{7}$ c. d.

e.

A moving conveyor is built to rise 1 meter for every 5 meters of horizontal change. 7. Suppose the conveyor runs between two floors in a factory. Find the length of the conveyor if the vertical distance between floors is 10 meters. Round your answer to the nearest meter.

- a. 61 meters
- b. 39 meters
- c. 51 meters
- d. 50 meters
- e. 41 meters

	8.	Find the slope of the line $x + 3y = 15$ .
a.	$\frac{1}{3}$	
b.	$\frac{\frac{1}{3}}{-\frac{1}{5}}$	
c.	$\frac{1}{5}$	
d.	$-\frac{1}{15}$	
e.	$-\frac{1}{15}$ $-\frac{1}{3}$	
	9.	Find the <i>y</i> -intercept of the line $x + 4y = 8$ .
a.	(0, 2)	
	(0, 4)	
	(0, 8)	
d.	(4, 0)	

e. (2, 0)

10. Find an equation of the line that passes through the point (7, 2) and has the slope *m* that is undefined.

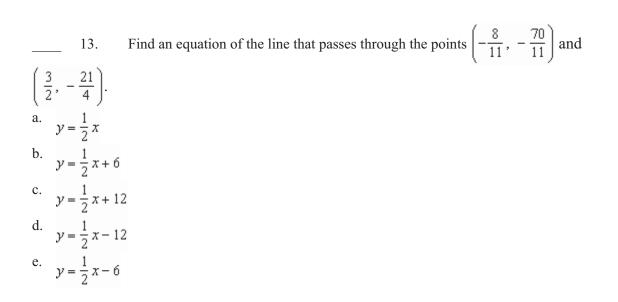
- a. y = 7
- b. x = 7
- c. y = 2
- d. x = 2e. y = 7x

11. Find an equation of the line that passes through the point (-11, -9) and has the slope  $m = \frac{9}{2}$ .

a.  $y = \frac{9}{2}x - \frac{81}{2}$ b.  $y = \frac{9}{2}x + \frac{81}{2}$ c.  $y = \frac{9}{2}x + 162$ d.  $y = \frac{9}{2}x$ e.  $y = -\frac{9}{2}x$ 

12. Find an equation of the line that passes through the points (18, -7) and (-18, 23).

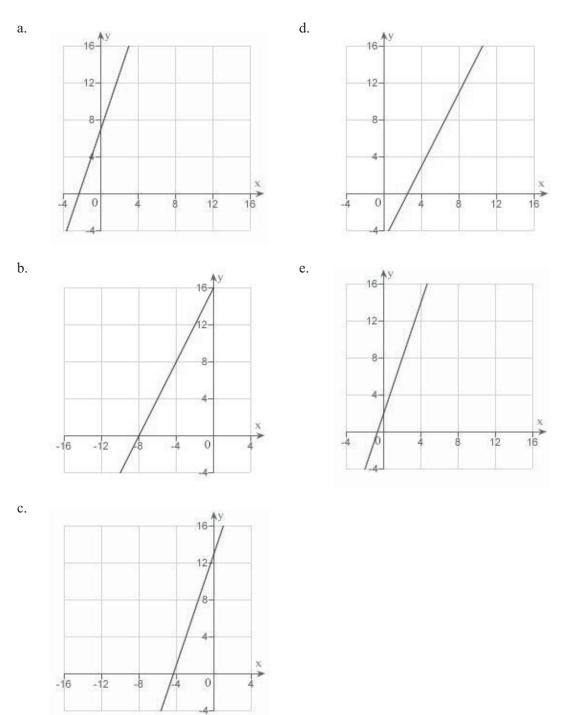
a.  $y = -\frac{5}{6}x - 8$ b.  $y = \frac{5}{6}x - 8$ c.  $y = \frac{5}{6}x + 8$ d.  $y = -\frac{5}{6}x + 8$ e.  $y = -\frac{5}{6}x$ 



14. Use the result, "the line with intercepts (a, 0) and (0, b) has the equation  $\frac{x}{a} + \frac{y}{b} = 1$ ,  $a \neq 0, b \neq 0$ ", to write an equation of the line with x-intercept: (8, 0) and y-intercept: (0, 7).

- a. 8x 7y 8 = 0
- b. 7x 8y + 7 = 0
- $c. \quad 8x + 7y + 8 = 0$
- d. 7x + 8y + 56 = 0
- e. 7x + 8y 56 = 0

15. Sketch a graph of the equation y - 8 = 2(x + 4).



<u>16.</u> Write an equation of the line that passes through the given point and is perpendicular to the given line.

Point Line (-1, -7) x = 6a. y = 7b. y = -7c. y = -1d. x = -1e. x = 1

\_\_\_\_\_ 17. Write an equation of the line that passes through the given point and is parallel to the given line.

Point Line (3,-4) -2x-5y = 9a. -2x-5y = 14b. -2x-5y = 23c. 2x-5y = 14d. -2x+5y = -26e. 2x-5y = 23

18. Write an equation of the line that passes through the point (-6, 4) and is perpendicular to the line x + y = 5.

- a. x y + 10 = 0b. x - y + 2 = 0
- $\mathbf{c}. \quad x + y 2 = 0$
- $d. \quad x + y + 10 = 0$
- $e. \quad x + y 5 = 0$

\_\_\_\_\_ 19. Write an equation of the line that passes through the point  $\left(\frac{5}{4}, \frac{5}{8}\right)$  and is parallel to

- the line 7x 3y = 0.
- a. 56x 24y 55 = 0
- b. 56x + 12y 55 = 0
- c. 56x 8y + 55 = 0
- $d. \quad 56x + 6y + 55 = 0$
- e. 56x + 4y 55 = 0

20. A real estate office handles an apartment complex with 50 units. When the rent is \$800 per month, all 50 units are occupied. However, when the rent is \$845, the average number of occupied units drops to 47. Assume that the relationship between the monthly rent p and the demand x is linear. Write a linear equation giving the demand x in terms of the rent p.

a. 
$$x = \frac{1}{15} (1595 - p)$$
  
b.  $x = \frac{1}{15} (1505 + p)$   
c.  $x = \frac{1}{45} (1550 + p)$   
d.  $x = \frac{1}{15} (1550 - p)$   
e.  $x = \frac{1}{45} (1595 - p)$ 

A real estate office handles an apartment complex with 50 units. When the rent is 21. \$600 per month, all 50 units are occupied. However, when the rent is \$645, the average number of occupied units drops to 47. Assume that the relationship between the monthly rent p and the demand x is linear. Predict the number of units occupied if the rent is raised to \$660.

- 43 units a.
- b. 54 units
- 57 units c.
- d. 49 units
- e. 46 units

Find the distance between the point (-4, 7) and line x - y - 2 = 0 using the formula, 22. Distance =  $\frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$  for the distance between the point  $(x_1, y_1)$  and the line Ax + By + C = 0.

- a.  $\frac{11\sqrt{2}}{2}$
- b.  $\frac{4\sqrt{3}}{3}$
- c.  $\frac{13\sqrt{2}}{2}$ d.  $\frac{9\sqrt{2}}{2}$ e.  $\frac{6\sqrt{3}}{3}$

23. Suppose that the dollar value of a product in 2008 is \$174 and the rate at which the value of the product is expected to increase per year during the next 5 years is \$7.50. Write a linear equation that gives the dollar value V of the product in terms of the year t. (Let t = 0 represent 2000.) Round the numerical values in your answer to one decimal place, where applicable.

- a. V = 7.5t 159
- b. V = -7.5t 114
- c. V = -7.5t + 174d. V = 7.5t + 114
- e. V = 7.5t 144

24. A company reimburses its sales representatives \$175 per day for lodging and meals plus  $45\phi$  per mile driven. Write a linear equation giving the daily cost *C* to the company in terms of *x*, the number of miles driven. Round the numerical values in your answer to two decimal places, where applicable.

- a. C = -1.75x + 45
- b. C = 0.45x + 175
- c. C = -0.45x 175
- d. C = 0.45x 175
- e. C = 1.75x 45

25. A company reimburses its sales representatives 160 per day for lodging and meals plus  $42\phi$  per mile driven. How much does it cost the company if a sales representative drives 135 miles on a given day? Round your answer to the nearest cent.

- a. 227.20
- b. 216.70
- c. 136.35
- d. 161.35
- e. 191.70

# **P.2 Linear Models and Rates of Change Answer Section**

#### **MULTIPLE CHOICE**

2.       ANS:       D       PTS:       1       DIF:       Easy       REF:       Section 0.2         OBJ:       Sketch the line passing through a point with specified slope       MSC:       Skill         3.       ANS:       B       PTS:       1       DIF:       Easy       REF:       Section 0.2         OBJ:       Calculate the slope of a line passing through two points       MSC:       Skill       Skill         4.       ANS:       C       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Calculate the slope of a line passing through two points       MSC:       Skill       Skill         5.       ANS:       A       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Identify a point on a line with specified properties       MSC:       Skill       MSC:       Skill         6.       ANS:       B       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Calulate slopes in applications       MSC:       Skill       MSC:       Skill         9.       ANS:       E       PTS:       1       DIF:       Med       REF:       Section 0.2	1. ODL	ANS:	E	PTS:	1	DIF:	Easy	REF:	
OBJ:Sketch the line passing through a point with specified slopeMSC:Skill3.ANS:BPTS:1DIF:EasyREF:Section 0.2OBJ:Calculate the slope of a line passing through two pointsMSC:SkillSkill4.ANS:CPTS:1DIF:MedREF:Section 0.2OBJ:Calculate the slope of a line passing through two pointsMSC:SkillSkill5.ANS:APTS:1DIF:MedREF:Section 0.2OBJ:Identify a point on a line with specified propertiesMSC:SkillSkillSkill6.ANS:BPTS:1DIF:MedREF:Section 0.2MSC:ApplicationTANS:CPTS:1DIF:MedREF:Section 0.2OBJ:Calculate slopes in applicationsMSC:ANS:APTS:1DIF:MedREF:Section 0.2OBJ:Manipulate a linear equation to determine its slopeMSC:SkillSkillSkillSkill10.ANS:BPTS:1DIF:EasyREF:Section 0.2OBJ:Write an equation of a line given a point on the line and its slopeMSC:Skill11.ANS:BPTS:1DIF:EasyREF:Section 0.2OBJ:Write an equation of a line given two points on the lineMSC:SkillSkill12.ANS:D <td></td> <td></td> <td>-</td> <td></td> <td></td> <td>DIE</td> <td>Б</td> <td></td> <td></td>			-			DIE	Б		
3.       ANS:       B       PTS:       1       DIF:       Easy       REF:       Section 0.2         OBJ:       Calculate the slope of a line passing through two points       MSC:       Skill         4.       ANS:       C       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Calculate the slope of a line passing through two points       MSC:       Skill       Skill         5.       ANS:       A       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Identify a point on a line with specified properties       MSC:       Skill       Skill       Section 0.2         OBJ:       Calculate slopes in applications       MSC:       Application       MSC:       Application         7.       ANS:       E       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Manipulate a linear equation to determine its slope       MSC:       Skill       Skill       Skill         9.       ANS:       B       PTS:       1       DIF:       Easy       REF:       Section 0.2         OBJ:       Manipulate a linear equation of a line given a point on the line and its slope       MSC:       Ski					-				
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6.       ANS:       B       PTS:       1       DIF:       Easy       REF:       Section 0.2         MSC:       Application       .       .       MSC:       Application 0.2         OBJ:       Calculate slopes in applications       .       MSC:       Application 0.2         8.       ANS:       E       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Manipulate a linear equation to determine its slope       MSC:       Skill       9       ANS:       A       PTS:       1       DIF:       Med       REF:       Section 0.2         OBJ:       Manipulate a linear equation to determine its y-intercept       MSC:       Skill       10.2         10.       ANS:       B       PTS:       1       DIF:       Easy       REF:       Section 0.2         OBJ:       Write an equation of a line given a point on the line and its slope       MSC:       Skill         11.       ANS:       B       PTS:       1       DIF:       Easy       REF:       Section 0.2         OBJ:       Write an equation of a line given two points on the line       MSC:       Skill       Skill         12.       ANS:       E       PTS:       1					-		Med		
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19 ANS: A PTS: 1 DIF: Easy REF: Section 0.2	MSC:	Skill							
	19.	ANS:	А	PTS:	1	DIF:	Easy	REF:	Section 0.2
OBJ: Write an equation of a line given a point on the line and a line to which it is parallel	OBJ:	Write an equa	ation of	a line given a p	oint on	the line and a l	ine to v	which it	is parallel
MSC: Skill	MSC:	Skill							

20.	ANS:	D	PTS:	1	DIF:	Med	REF:	Section 0.2
OBJ:	Write linear e	quation	s in application	S			MSC:	Application
21.	ANS:	Е	PTS:	1	DIF:	Easy	REF:	Section 0.2
OBJ:	Evaluate linea	r equat	ions in applicat	ions			MSC:	Application
22.	ANS:	С	PTS:	1	DIF:	Med	REF:	Section 0.2
OBJ:	Calculate the	distance	e between a poi	nt and	a line		MSC:	Skill
23.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.2
OBJ:	Write linear equations in applications							Application
24.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.2
OBJ:	Write linear e	MSC:	Application					
25.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.2
OBJ:	Evaluate linea	r equat	ions in applicat	ions			MSC:	Application

## **P.3 Functions and Their Graphs**

#### **Multiple Choice**

Identify the choice that best completes the statement or answers the question.

1. Evaluate (if possible) the function f(x) = -6x - 5 at x = -2. Simplify the result.

- -7 a.
- b. 17
- 3 c.
- d. 7
- e. undefined

Evaluate (if possible) the function  $f(x) = \sqrt{x-5}$  at x = 9. Simplify the result. 2.

- a. 3
- b. 2
- c. −2
- d. 4
- e. undefined

Evaluate (if possible) the function  $g(x) = x^2(x+2)$  at x = t - 6. Simplify the result. 3.

- a.  $t^3 4t^2 + 12t 144$ b.  $t^3 - 4t^2 + 84t - 144$
- c.  $t^3 16t^2 + 84t 144$
- d.  $t^3 16t^2 + 12t 144$
- e. none of the above

4. Let 
$$f(x) = 14x + 8$$
. Then simplify the expression  $\frac{f(x) - f(9)}{x - 9}$ .

- a. 15
- b. 14
- c. 19
- d. 11
- e. undefined

5. Let 
$$g(x) = \frac{1}{\sqrt{x+15}}$$
. Evaluate the expression  $\frac{g(x) - g(-11)}{x+11}$  and then simplify the

result.

a. 
$$\frac{2\sqrt{x+15} - x - 15}{2(x+11)(x+15)}$$
  
b. 
$$2\sqrt{x+15} + x - 15$$

c. 
$$\frac{2(x-11)(x+15)}{2\sqrt{x+15}+x-15}$$

d. 
$$\frac{2\sqrt{x+15} - x - 15}{2(x-11)(x+15)}$$

e. undefined

6. Find the domain and range of the function  $f(x) = x^2 - 6$ .

- a. domain: [−6, ∞) range: [−6, ∞)
- b. domain: [-6, ∞) range: (-6, ∞)
- c. domain: (-∞, ∞) range: (-6, ∞)
- d. domain: (-∞, ∞) range: [6, ∞)
- e. domain: (-∞, ∞) range: [-6, ∞)

7. Find the domain and range of the function  $g(t) = \sqrt{t-10}$ .

- a. domain: [10, ∞) range: (0, ∞)
- b. domain: (10, ∞) range: [0, ∞)
- c. domain: [10, ∞) range: (-∞, ∞)
- d. domain: [0, ∞) range: [10, ∞)
- e. none of the above

8. Find the domain and range of the function  $h(x) = \frac{11}{x+6}$ .

- a. domain: (-∞, 6) ∪ (-6, ∞)
   range: (-∞, ∞)
- b. domain:  $(-\infty, -6) \cup (-6, \infty)$ range:  $(-\infty, 0) \cup (0, \infty)$
- c. domain:  $(-\infty, -6] \cup [-6, \infty)$ range:  $(-\infty, 0) \cup (0, \infty)$
- domain: (-∞, 6)
   range: (0, ∞)
- e. domain: (−6, ∞) range: (0, ∞)

9. Evaluate the function 
$$f(x) = \begin{cases} 2x+1, x < 0 \\ 2x+2, x \ge 0 \end{cases}$$
 at  $f(5)$ .

- a. f(5) = 6
- b. f(5) = 5
- c. f(5) = 13
- d. f(5) = 11
- e. f(5) = 12

10. Determine the domain and range of the function  $f(x) = \begin{cases} 3x + 2, x < 0 \\ 3x + 6, x \ge 0 \end{cases}$ .

- a. domain: (-∞, 2)
- range:  $(-\infty, 2) \cap [6, \infty]$ b. domain:  $(-\infty, \infty)$
- range:  $(-\infty, 2) \cup [6, \infty)$ c. domain:  $(-\infty, \infty)$
- range:  $(-\infty, 2) \cup (\infty, 6]$
- d. domain:  $(-\infty, \infty)$ range:  $(\infty, 2) \cup (6, -\infty)$
- e. domain: (-∞, 3) range: (-∞, 2) ∩ [6, ∞)
  - 11. Determine whether *y* is a function of *x*.

 $y - 5x^2 = 6$ 

- a. no
- b. yes

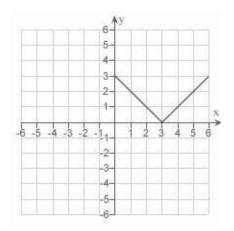
12. Determine whether *y* is a function of *x*.

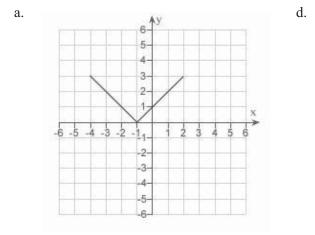
# $xy - x^2 = 3y + x$

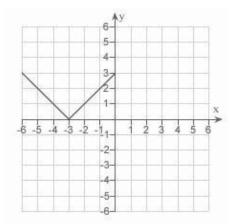
#### a. no

b. yes

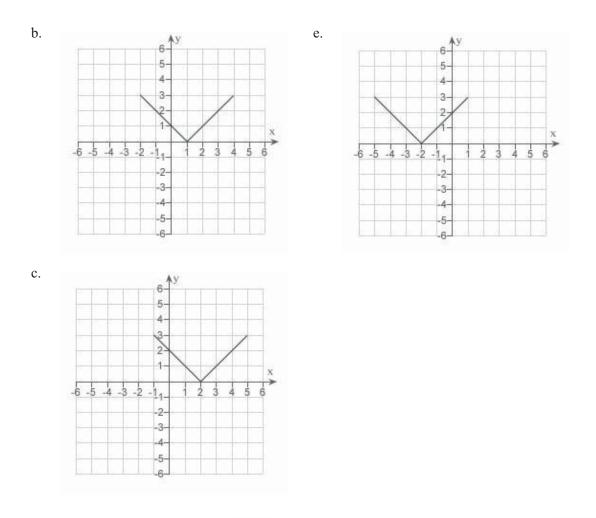
13. Use the graph of y = f(x) given below to find the graph of the function y = f(x + 5).



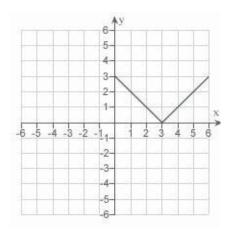


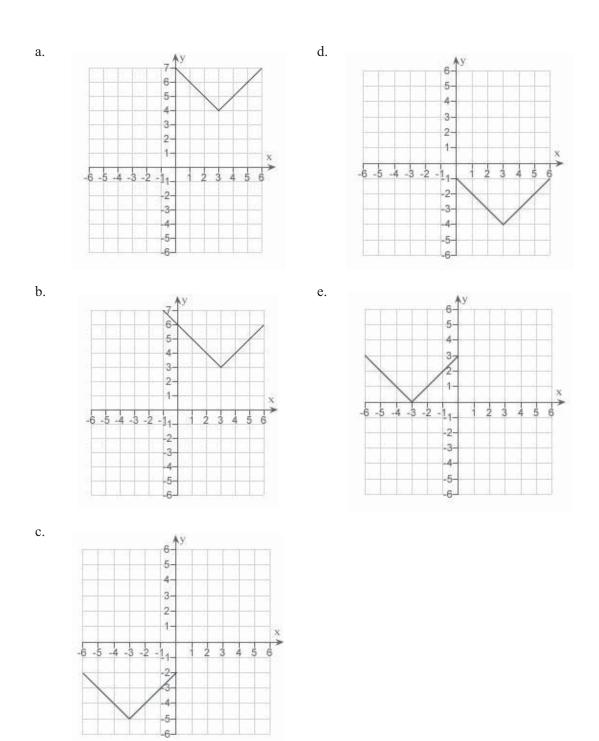


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14. Use the graph of y = f(x) given below to find the graph of the function y = f(x) + 4.





$$15. \quad \text{Given } f(x) = \cos x \text{ and } g(x) = \frac{\pi}{2} x, \text{ evaluate } f(g(2)).$$
a. 0
b.  $\frac{1}{2}$ 
c.  $\frac{\pi}{2} \sin(2)$ 
d.  $-1$ 
e.  $\frac{\pi}{2} \cos(2)$ 

16. Determine whether the function is even, odd, or neither.

$$f(x) = x^2(3-x)^2$$

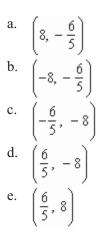
- a. odd
- b. even
- c. neither

17. Determine whether the function is even, odd, or neither.

 $f(x) = x \sin 2x$ 

- a. even
- b. odd
- c. neither

18. Find the coordinates of a second point on the graph of a function *f* if the given point  $\left(-\frac{6}{5}, 8\right)$  is on the graph and the function is even.



19. Find the coordinates of a second point on the graph of a function *f* if the given point  $\left[-\frac{9}{8}, 5\right]$  is on the graph and the function is odd.

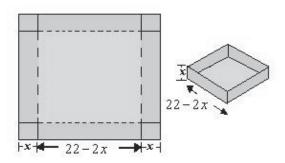
a. 
$$\left(-5, -\frac{9}{8}\right)$$
  
b.  $\left(\frac{9}{8}, -5\right)$   
c.  $\left(-5, \frac{9}{8}\right)$   
d.  $\left(-\frac{9}{8}, -5\right)$   
e.  $\left(\frac{9}{8}, 5\right)$ 

20. The horsepower *H* required to overcome wind drag on a certain automobile is approximated by  $H(x) = 0.002x^2 + 0.005x - 0.027$ ,  $10 \le x \le 100$  where *x* is the speed of the car in miles per hour. Find  $H\left(\frac{x}{1.1}\right)$ . Round the numerical values in your answer to five decimal places.

a.  $H\left(\frac{x}{1.1}\right) = 0.00150x^2 + 0.00455x - 0.02700$ b.  $H\left(\frac{x}{1.1}\right) = 0.00150x^2 + 0.00165x - 0.00455$ c.  $H\left(\frac{x}{1.1}\right) = 0.00165x^2 + 0.00150x - 0.02700$ d.  $H\left(\frac{x}{1.1}\right) = 0.00165x^2 + 0.00455x - 0.02700$ e.  $H\left(\frac{x}{1.1}\right) = 0.00455x^2 + 0.00165x - 0.02700$ 

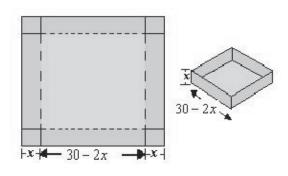
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21. An open box of maximum volume is to be made from a square piece of material 22 centimeters on a side by cutting equal squares from the corners and turning up the sides (see figure). Write the volume V as a function of x, the length of the corner squares.



- a.  $V = x(22 2x)^2$
- b.  $V = x + (22 x)^2$
- c.  $V = x^2 + (22 2x)$
- d.  $V = x^2(22 2x)$
- e. V = x(22 2x)

22. An open box of maximum volume is to be made from a square piece of material 30 centimeters on a side by cutting equal squares from the corners and turning up the sides(see figure). What is the domain of the function  $V = x(30 - 2x)^2$ .



- a. domain:  $0 < x < \infty$
- b. domain: 30
- c. domain: 0 < x < 15
- d. domain: 0 < x < 30
- e. domain: 15

## **P.3 Functions and Their Graphs Answer Section**

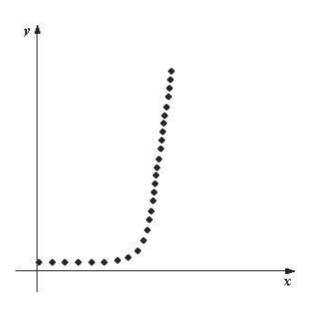
1	ANS:	D	PTS:	1	DIF:	Form	REF:	Section 0.3
1. OBJ:	Evaluate a fund			1	DII'.	Easy	MSC:	Skill
		B	PTS:	1	DIF:	East	REF:	
2. OBJ:				1	DIF:	Easy	MSC:	Section 0.3 Skill
	Evaluate a fund			1	DIE	<b>F</b>		
3.		C	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Evaluate a fund			1	DIE	N 1	MSC:	Skill
4.		В	PTS:	1	DIF:	Med	REF:	Section 0.3
OBJ:	Simplify a diff		·		DIE	26.1	MSC:	Skill
5.		A	PTS:	1	DIF:	Med	REF:	Section 0.3
OBJ:	Simplify a diff				DIE	-	MSC:	Skill
6.		Е	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify the do		•			_	MSC:	Skill
7.		E .	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify the do		-				MSC:	Skill
8.		В	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify the do		•	functio			MSC:	Skill
9.		E	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Evaluate a piec						MSC:	Skill
10.		В	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify the do	main a	-	functio	n		MSC:	Skill
11.		В	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify equation	ons the	at are function	15			MSC:	Skill
12.		В	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify equation	ons the	at are function	15			MSC:	Skill
13.	ANS:	Е	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Graph transform	matior	ns of functions	5			MSC:	Skill
14.	ANS:	А	PTS:	1	DIF:	Med	REF:	Section 0.3
OBJ:	Graph transform	matior	ns of functions	5			MSC:	Skill
15.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Evaluate comp	osite f	functions				MSC:	Skill
16.	ANS:	С	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify the typ	be of s	ymmetry of th	ne graph	of a function		MSC:	Skill
17.	ANS:	А	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify the typ	be of s	ymmetry of th	ne graph	of a function		MSC:	Skill
18.	ANS:	Е	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify points	on a g	graph using sy	mmetry		•	MSC:	Skill
19.	ANS:	В	PTS:	1	DIF:	Easy	REF:	Section 0.3
OBJ:	Identify points	on a g	graph using sy	mmetry		•	MSC:	Skill
20.		D	PTS:	1	DIF:	Med	REF:	Section 0.3
OBJ:	Apply composition	ite fun	ctions				MSC:	Application
21.		А	PTS:	1	DIF:	Med	REF:	Section 0.3
OBJ:	Create function	ns in a	pplications				MSC:	Application
22.		C	PTS:	1	DIF:	Med	REF:	Section 0.3
OBJ:	Identify domai	ns in a					MSC:	Application
			••					

# P.4 Fitting Models to Data

### **Multiple Choice**

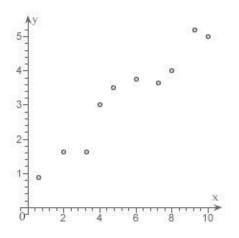
Identify the choice that best completes the statement or answers the question.

1. Determine which type of function would be most appropriate to fit the given data.



- a. exponential
- b. linear
- c. quadratic
- d. no relationship
- e. trigonometric

2. Which function below would be most appropriate model for the given data?



- a. no apparent relationship between x and y
- b. trigonometric
- c. quadratic
- d. linear

3. Hooke's Law states that the force F required to compress or stretch a spring (within its elastic limits) is proportional to the distance d that the spring is compressed or stretched from its original length. That is, F = kd where k is a measure of the stiffness of the spring and is called the spring constant. The table shows the elongation d in centimeters of a spring when a force of F newtons is applied. Use the regression capabilities of a graphing utility to find a linear model for the data. Round the numerical values in your answer to three decimal places.

F	20	40	60	80	100
d	1.9	3.8	5.7	7.6	9.5

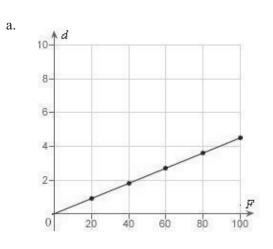
- a. d = 0.675F
- b. d = 0.118F
- c. d = 0.112F
- d. d = 0.095F
- e. d = 0.905F

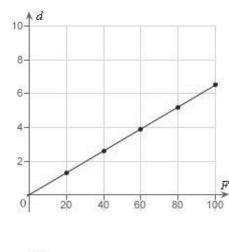
4. Hooke's Law states that the force *F* required to compress or stretch a spring (within its elastic limits) is proportional to the distance *d* that the spring is compressed or stretched from its original length. That is, F = kd where *k* is a measure of the stiffness of the spring and is called the spring constant. The table shows the elongation *d* in centimeters of a spring when a force of *F* newtons is applied. Use a graphing utility to plot the data and graph the linear model.

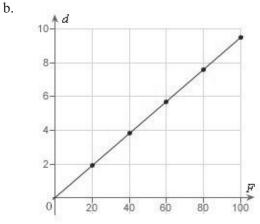
d.

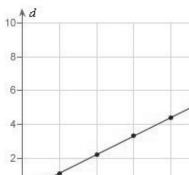
e.

F	20	40	60	80	100
d	1.3	2.6	3.9	5.2	6.5









40

60

80

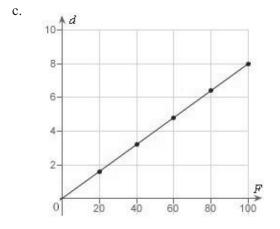
F

100

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0

20



5. Hooke's Law states that the force F required to compress or stretch a spring (within its elastic limits) is proportional to the distance d that the spring is compressed or stretched from its original length. That is, F = kd where k is a measure of the stiffness of the spring and is called the spring constant. The table shows the elongation d in centimeters of a spring when a force of F newtons is applied. Use the model d = 0.085 F to estimate the elongation of the spring when a force of 55 newtons is applied. Round your answer to two decimal places.

F	20	40	60	80	100
d	1.7	3.4	5.1	б.8	8.5

a. 8.08 cm

b. 6.38 cm

c. 4.68 cm

d. 2.98 cm

e. 9.78 cm

6. In an experiment, students measured the speed *s* (in meters per second) of a falling object *t* seconds after it was released. The results are shown in the table below. Use the regression capabilities of a graphing utility to find a linear model for the data. Round all numerical values in your answer to one decimal place.

ţ	0	1	2	3	4
5	0	13.0	21.4	31.2	41.4

- a. s = 10.1t + 1.2
- b. s = 3.0t 1.2
- c. s = 1.2t + 10.1
- d. s = 10.1t + 3.0
- e. s = 1.2t 3.0

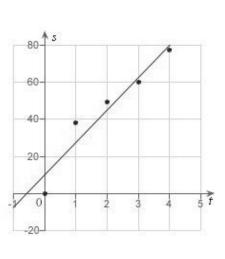
7. In an experiment, students measured the speed s (in meters per second) of a falling object t seconds after it was released. The results are shown in the table below. Use the regression capabilities of a graphing utility to find a linear model for the data. Round all numerical values in your answer to one decimal place.

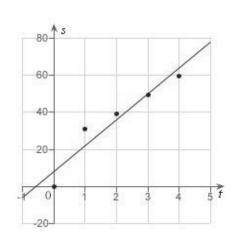
d.

e.

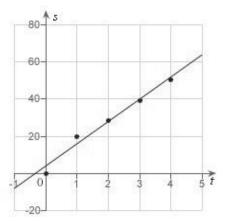
t	0	1	2	3	4
5	0	40	48.4	58.2	68.4

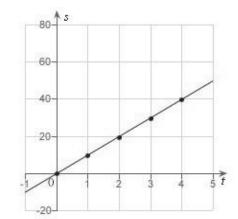


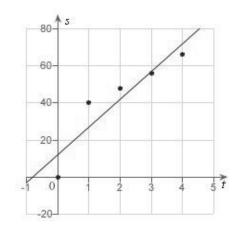












8. In an experiment, students measured the speed *s* (in meters per second) of a falling object *t* seconds after it was released. The results are shown in the table below. Use the model s = 11.9t + 4.8 to estimate the speed of the object after 1.5 seconds. Round your answer to two decimal places.

t	0	1	2	3	4
5	0	22.0	30.4	40.2	50.4

a. 21.05 meters/second

c.

- b. 20.95 meters/second
- c. 24.25 meters/second
- d. 23.55 meters/second
- e. 22.65 meters/second

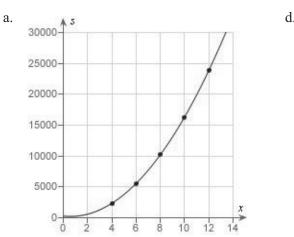
9. Students in a lab measured the breaking strength S (in pounds) of wood 2 inches thick, x inches high, and 12 inches long. The results are shown in the table below. Use the regression capabilities of a graphing utility to fit a quadratic model to the data. Round the numerical values in your answer to two decimal places, where applicable.

х	4	б	8	10	12	
ន	2422	5512	10, 362	16, 302	23, 912	

- a.  $S = 170.89x^2 209.79x + 324$
- b.  $S = 180.89x^2 205.79x + 324$
- c.  $S = 190.89x^2 + 201.79x + 331$
- d.  $S = 170.89x^2 209.79x + 327$
- e.  $S = 180.89x^2 + 203.79x 331$

10. Students in a lab measured the breaking strength S (in pounds) of wood 2 inches thick, x inches high, and 12 inches long. The results are shown in the table below. Use a graphing utility to plot the data and graph the quadratic model.

х	4	б	8	10	12
ಭ	2370	4460	13,310	19, 250	29, 860



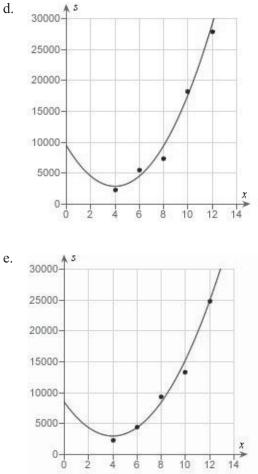
b.

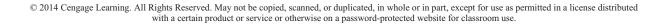
**∧** s

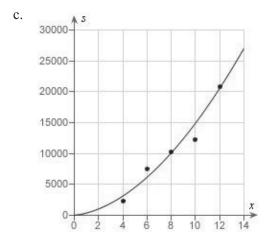
30000-

0+

é







11. Students in a lab measured the breaking strength S (in pounds) of wood 2 inches thick, x inches high, and 12 inches long. The results are shown in the table below. Use the model  $S = 180.89x^2 - 205.79x + 284$  to approximate the breaking strength when x = 2. Round your answer to two decimal places.

х	4	б	8	10	12
ಭ	2382	5472	10, 322	16, 262	23, 872

- a. 595.98 pounds
- b. 390.19 pounds
- c. 957.76 pounds
- d. 801.77 pounds
- e. 751.97 pounds

12. A V8 car engine is coupled to a dynamometer and the horsepower y is measured at different engine speeds x (in thousands of revolutions per minute). The results are shown in the table below. Use the regression capabilities of a graphing utility to find a cubic model for the data. Round the numerical values in your answer to three decimal places, where applicable.

х	1	2	3	4	5	б
у	64	109	164	224	249	269

- a.  $y = -1.608x^3 14.583x^2 + 13.389x 37$
- b.  $y = -1.706x^3 14.583x^2 16.389x + 34$
- c.  $y = 1.806x^3 + 11.583x^2 + 16.389x 41$
- d.  $y = -1.806x^3 + 14.583x^2 + 16.389x + 34$
- e.  $y = 1.608x^3 + 11.583x^2 19.389x + 41$

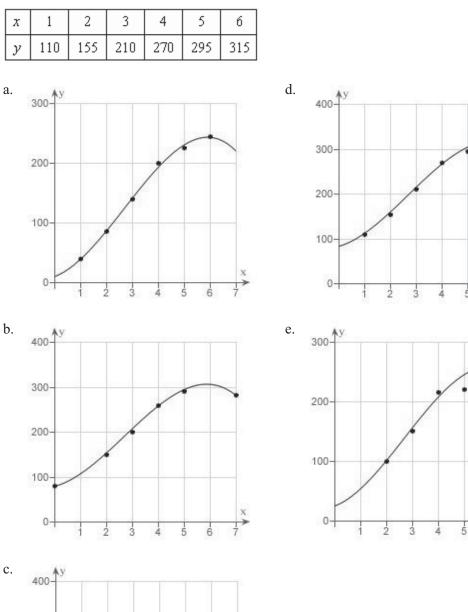
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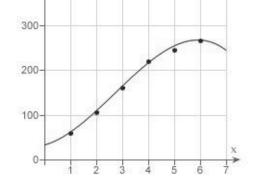
13. A V8 car engine is coupled to a dynamometer and the horsepower y is measured at different engine speeds x (in thousands of revolutions per minute). The results are shown in the table below. Use a graphing utility to plot the data and graph the cubic model.

x

6

é





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14. A V8 car engine is coupled to a dynamometer and the horsepower y is measured at different engine speeds x (in thousands of revolutions per minute). The results are shown in the table below. Use the model  $y = -1.806x^3 + 14.58x^2 + 16.4x + 30$  to approximate the horsepower when the engine is running at 5500 revolutions per minute. Round your answer to two decimal places.

х	1	2	3	4	5	б
у	60	105	160	220	245	265

a. 260.77 hp

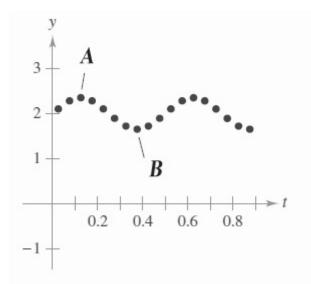
b. 262.73 hp

c. 262.36 hp

d. 261.38 hp

e. 261.91 hp

15. The motion of an oscillating weight suspended by a spring was measured by a motion detector. The data collected and the approximate maximum (positive and negative) displacements from equilibrium are shown in the figure. The displacement is measured in centimeters, and the time is measured in seconds. Take A(0.133,2.49) and B(0.343,1.78). Approximate the amplitude and period of the oscillations.



- a. Amplitude = 0.335. Period = 4.3.
- b. Amplitude = 0.71. Period = 2.1.
- c. Amplitude = 0.355. Period = 4.2.
- d. Amplitude = 4.2. Period = 0.355.
- e. Amplitude = 2.1. Period = 0.71.

# **P.4 Fitting Models to Data Answer Section**

## **MULTIPLE CHOICE**

1.	ANS:	А	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Identify the n	nost app	propriate functi	ion for a	a scatter plot		MSC:	Skill
2.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Identify the n	nost app	propriate functi	ion for a	a scatter plot		MSC:	Skill
3.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Write a linear	r model	for data using	the reg	ression capabil	ities of a graphi	ng utility	<i>y</i>
MSC:	Application							
4.	ANS:	D	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Plot data poir	nts and	the graph of a l	linear n	nodel		MSC:	Application
5.	ANS:	С	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Evaluate line	ar mod	els in application	ons			MSC:	Application
6.	ANS:	А	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Write a linear	r model	for data using	the reg	ression capabil	ities of a graphi	ng utility	<i>y</i>
MSC:	Application							
7.	ANS:	С	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Plot data poir	nts and	the graph of a l	linear n	nodel		MSC:	Application
8.	ANS:	E	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Evaluate line	ar mod	els in application	ons			MSC:	Application
9.	ANS:	В	PTS:	1	DIF:	Med	REF:	Section 0.4
OBJ:		ratic mo	odel for data us	ing the	regression capa	abilities of a gra	aphing ut	ility
	Application							
10.	ANS:	В	PTS:	1	DIF:	Med	REF:	Section 0.4
OBJ:	Plot data poir	nts and	the graph of a o	quadrat	ic model		MSC:	Application
11.	ANS:	А	PTS:	1	DIF:	Med	REF:	Section 0.4
OBJ:	Evaluate qua	dratic n	nodels in applic	cations			MSC:	Application
12.	ANS:	D	PTS:	1	DIF:	Med	REF:	Section 0.4
OBJ:	Evaluate cubi	ic mode	els in application	ons			MSC:	Application
13.	ANS:	D	PTS:	1	DIF:	Med	REF:	Section 0.4
OBJ:	Plot data poir	nts and	the graph of a	cubic m	odel		MSC:	Application
14.	ANS:	А	PTS:	1	DIF:	Med	REF:	Section 0.4
OBJ:	Write a cubic	model	for data using	the reg	ression capabili	ities of a graphi	ng utility	7
MSC:	Application							
15.	ANS:	С	PTS:	1	DIF:	Easy	REF:	Section 0.4
OBJ:	Fit a trigonon	netric n	nodel to a real-	life data	a set.		MSC:	Application

# **1.1 A Preview of Calculus**

## **Multiple Choice**

Identify the choice that best completes the statement or answers the question.

1. Decide whether the following problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

Find the distance traveled in 16 seconds by an object traveling at a constant velocity of 20 feet per second.

- a. calculus, 320 ft
- b. calculus, 340 ft
- c. precalculus, 320 ft
- d. calculus, 640 ft
- e. precalculus, 640 ft

2. Decide whether the following problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

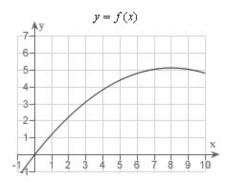
Find the distance traveled in 20 seconds by an object moving with a velocity of  $v(t) = 8 + 6\cos t$  feet per second.

- a. calculus, 162.4485 ft
- b. precalculus, 163.7985 ft
- c. calculus, 165.4777 ft
- d. precalculus, 165.4777 ft
- e. precalculus, 162.4485 ft

3. Decide whether the following problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

A cyclist is riding on a path whose elevation is modeled by the function  $f(x) = 0.08 (16x - x^2)$  where x and f(x) are measured in miles. Find the rate of change of elevation when x = 4.

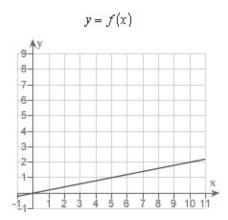
### 44 Chapter 1: Limits and Their Properties



- a. precalculus, 0.08
- b. calculus, 0.2
- c. calculus, 0.64
- d. calculus, 0.08
- e. precalculus, 0.2

4. Decide whether the following problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

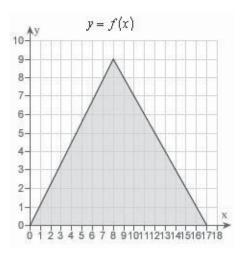
A cyclist is riding on a path whose elevation is modeled by the function f(x) = 0.2x where x and f(x) are measured in miles. Find the rate of change of elevation when x = 5.



- a. calculus, 2
- b. precalculus, 0.2
- c. calculus, 0.2
- d. precalculus, 2
- e. precalculus, 0.45

5. Decide whether the following problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

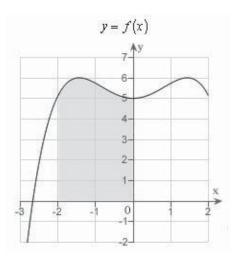
Find the area of the shaded region bounded by the triangle with vertices (0,0), (8,9), (17,0).



- a. precalculus, 153
- b. calculus, 229.5
- c. precalculus, 76.5
- d. precalculus, 229.5
- e. calculus, 153

6. Decide whether the following problem can be solved using precalculus, or whether calculus is required. If the problem can be solved using precalculus, solve it. If the problem seems to require calculus, use a graphical or numerical approach to estimate the solution.

Find the area of the shaded region.



- a. calculus, 11
- b. precalculus, 11
- c. precalculus, 13

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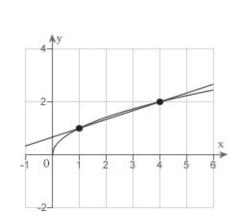
46 Chapter 1: Limits and Their Properties

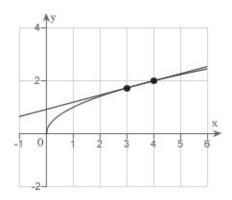
- d. calculus, 16
- e. precalculus, 16

7. Consider the function  $f(x) = \sqrt{x}$  and the point P(4, 2) on the graph of f. Graph f and the secant line passing through P(4, 2) and Q(x, f(x)) for x = 3.

d.

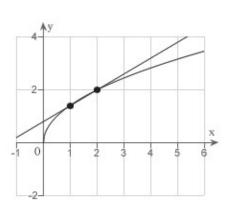
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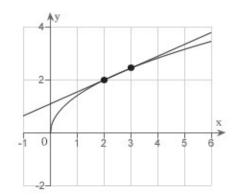




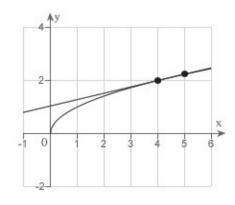
b.

a.









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