

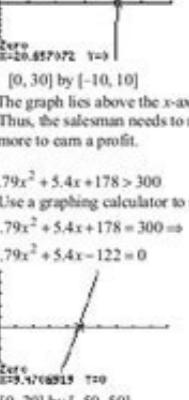
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41.  $P = x^2 - 12x - 32$   
The company makes a profit when  
 $x^2 - 12x - 32 > 0$ .  
Solve the corresponding equation.  
 $x^2 - 12x - 32 = 0$   
 $2(x+2)(x-16) = 0$   
( $x+2)(x-16) = 0 \Rightarrow x = -2$  or  $x = 16$   
The test regions are  $A(-\infty, -2)$ ,  $B(-2, 16)$ , and  
 $C(16, \infty)$ . Region  $A$  makes no sense in the  
context of the problem. Test a number from  
region  $B$ , let  $x = 0$ .  
For region  $B$ , let  $x = 0$ .  
 $2(0)^2 - 12(0) - 32 = -32 < 0$   
For region  $C$ , let  $x = 16$ .  
 $2(16)^2 - 12(16) - 32 = 48 > 0$   
The numbers in region  $C$  satisfy the inequality.  
The company makes a profit when the amount  
spent on advertising in millions of thousands of  
dollars is in the interval  $[8, \infty)$ .
42.  $P = x^2 - 14x + 14$   
We only consider the values of  $x$  for which  
 $P > 0$ , that is, we must solve the inequality  
 $x^2 - 14x + 14 > 0$ .  
Solve the corresponding equation.  
 $x^2 - 14x + 14 = 0$   
 $2(7)^2 - 14(7) + 14 = 0$   
 $(2t-14)(t-7) = 0 \Rightarrow t = 7$  or  $t = 7$   
We only consider positive values of  $t$  because  
 $t$  represents time in months. The test regions  
are  $A(0, 7]$ ,  $B[\frac{7}{2}, 7]$ , and  $C[7, \infty)$ .  
In region A, let  $t = \frac{1}{2}$ .  
 $\frac{1}{4} - 14(\frac{1}{2}) + 14 = 7 > 0$   
In region B, let  $t = 3$ .  
 $9 - 14(3) + 14 = -40 < 0$ .  
In region C, let  $t = 10$ .  
 $100 - 14(10) + 14 = 114 > 0$ .  
The solution is  $[0, \frac{1}{2}]$  or  $(7, \infty)$ .  
The investor makes a profit between  $t = 0$  and  
 $t = \frac{1}{2}$  month and after  $7 \frac{1}{2}$  months.

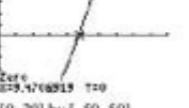
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43.  $P = x^2 - 30x - 18,000$   
The company makes a profit when  
 $x^2 - 30x - 18,000 > 0$ .  
Solve the corresponding equation.  
 $x^2 - 30x - 18,000 = 0$   
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{30 \pm \sqrt{(30)^2 - 4(1)(-18,000)}}{2(1)} = 21.25$   
We only consider positive values of  $x$  because  
 $x$  represents the number of apartments rented.  
The test regions are  $A(0, 52)$  and  $B(52, 200)$ .  
In region A, let  $x = 1$ .  
 $(1)^2 + 1000 = 1001 > 18,000$   
 $(1)^2 + 1000 = 1001 > 18,000 > 0$ .  
The company makes a profit when the number of  
units rented is in the interval  $(1, 52)$ , inclusive, or  
when  $x$  is in the interval  $[52, 200]$ .
44.  $x^2 + 5x - 50 > 0$   
Use a graphing calculator to solve.  
 $x^2 + 5x - 50 = 0$



[0, 30] by [-10, 10]  
The graph lies above the  $x$ -axis for  $x > 20.67$ .  
Thus, the investor needs to make 21 pitches more  
to earn a profit.

45.  $79t^2 + 5.4t + 178 > 300$   
Use a graphing calculator to solve.  
 $79t^2 + 5.4t + 178 = 300 \Rightarrow$



[0, 20] by [0, 300]  
The graph lies above the  $x$ -axis for  $t > 7.47$ ,  
which corresponds to the middle of 2009. Thus,  
there will be more than 300 million subscribers  
from 2010.

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- SECTION 2.1 EQUATIONS OF LINES** — 81
72.  $x = 0$   
 $x = 0$  is the  $y$ -axis.  
The  $y$ -axis contains all points of the form  $(0, y)$ .  
Find the slope.  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - 0}{x_2 - 0} = \frac{y_2}{x_2}$   
Let  $x_2 = 1$ .  
 $m = \frac{y_2}{1} = y_2$   
According to the slope-intercept form, there will be 142  
employees working in 2009.  
73.  $x = 100$   
 $x = 100$  is the  $y$ -axis.  
The  $y$ -axis contains all points of the form  $(0, y)$ .  
Find the slope.  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - 0}{x_2 - 0} = \frac{y_2}{x_2}$   
Let  $x_2 = 100$ .  
 $m = \frac{y_2}{100} = y_2$   
According to the slope-intercept form, there will be 100  
employees working in 2009.  
74.  $x = 10$   
 $x = 10$  is the  $y$ -axis.  
The  $y$ -axis contains all points of the form  $(0, y)$ .  
Find the slope.  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - 0}{x_2 - 0} = \frac{y_2}{x_2}$   
Let  $x_2 = 10$ .  
 $m = \frac{y_2}{10} = y_2$   
According to the slope-intercept form, there will be 10  
employees working in 2009.  
75.  $x = 1000$   
 $x = 1000$  is the  $y$ -axis.  
The  $y$ -axis contains all points of the form  $(0, y)$ .  
Find the slope.  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - 0}{x_2 - 0} = \frac{y_2}{x_2}$   
Let  $x_2 = 1000$ .  
 $m = \frac{y_2}{1000} = y_2$   
According to the slope-intercept form, there will be 1000  
employees working in 2009.

76.  $x = 10$   
 $x = 10$  is the  $y$ -axis.  
The  $y$ -axis contains all points of the form  $(0, y)$ .  
Find the slope.  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - 0}{x_2 - 0} = \frac{y_2}{x_2}$   
Let  $x_2 = 10$ .  
 $m = \frac{y_2}{10} = y_2$   
According to the slope-intercept form, there will be 10  
employees working in 2009.  
77.  $x = 1000$   
 $x = 1000$  is the  $y$ -axis.  
The  $y$ -axis contains all points of the form  $(0, y)$ .  
Find the slope.  
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - 0}{x_2 - 0} = \frac{y_2}{x_2}$   
Let  $x_2 = 1000$ .  
 $m = \frac{y_2}{1000} = y_2$   
According to the slope-intercept form, there will be 1000  
employees working in 2009.

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## 88 CHAPTER 2 GRAPHS, LINES, AND INEQUALITIES

- d. The correlation coefficient is .988. This indicates that the line is a good fit.

43.  $-3 \leq 4x - 1 \leq 7$   
 $-2 \leq 4x \leq 8$

39.  $-6x + 3 < 2x$   
 $-6x + 6x + 3 < 2x + 6x$

$3 < 8x$

$\frac{3}{8} < \frac{8x}{8}$

$\frac{3}{8} < x$  or  $x > \frac{3}{8}$

The solution is  $\left(\frac{3}{8}, \infty\right)$ .

40.  $12z \geq 5z - 7$

$12z - 5z \geq 5z - 5z - 7$

$7z \geq -7$

$\frac{7z}{7} \geq \frac{-7}{7}$

$z \geq -1$

The solution is  $[-1, \infty)$ .

41.  $2(3 - 2m) \geq 8m + 3$

$6 - 4m \geq 8m + 3$

$6 - 12m \geq 3 - 6$

$-12m \geq -3$

$\frac{-12m}{-12} \leq \frac{-3}{-12}$

$m \leq \frac{1}{4}$

The solution is  $\left(-\infty, \frac{1}{4}\right]$ .

42.  $6p - 5 > -(2p + 3)$

$6p - 5 > -2p - 3$

$8p - 5 > -3$

$8p > 2$

$\frac{8p}{8} > \frac{2}{8}$

$p > \frac{1}{4}$

The solution is  $\left(\frac{1}{4}, \infty\right)$ .

43.  $-3 \leq 4x - 1 \leq 7$   
 $-2 \leq 4x \leq 8$

$-\frac{1}{2} \leq x \leq 2$

The solution is  $\left[-\frac{1}{2}, 2\right]$ .

44.  $0 \leq 3 - 2x \leq 15$

$0 - 3 \leq 3 - 3 - 2x \leq 15 - 3$

$-3 \leq -2x \leq 12$

$\frac{-3}{-2} \geq \frac{-2x}{-2} \geq \frac{12}{-2}$

$\frac{3}{2} \geq x \geq -6$

The solution is  $\left[-6, \frac{3}{2}\right]$ .

45.  $|b| \leq 8 \Rightarrow -8 \leq b \leq 8$

The solution is  $[-8, 8]$ .

46.  $|a| > 7 \Rightarrow a < -7$  or  $a > 7$

The solution is  $(-\infty, -7) \cup (7, \infty)$ .

47.  $|2x - 7| \geq 3$

$2x - 7 \leq -3$  or  $2x - 7 \geq 3$

$2x \leq 4$  or  $2x \geq 10$

$x \leq 2$  or  $x \geq 5$

The solution is  $(-\infty, 2] \cup [5, \infty)$ .

48.  $|4m + 9| \leq 16$

$-16 \leq 4m + 9 \leq 16$

$-25 \leq 4m \leq 7$

$-\frac{25}{4} \leq m \leq \frac{7}{4}$

The solution is  $\left[-\frac{25}{4}, \frac{7}{4}\right]$ .

49.  $|5k + 2| - 3 \leq 4$

$|5k + 2| \leq 7$

$-7 \leq 5k + 2 \leq 7$

$-9 \leq 5k \leq 5$

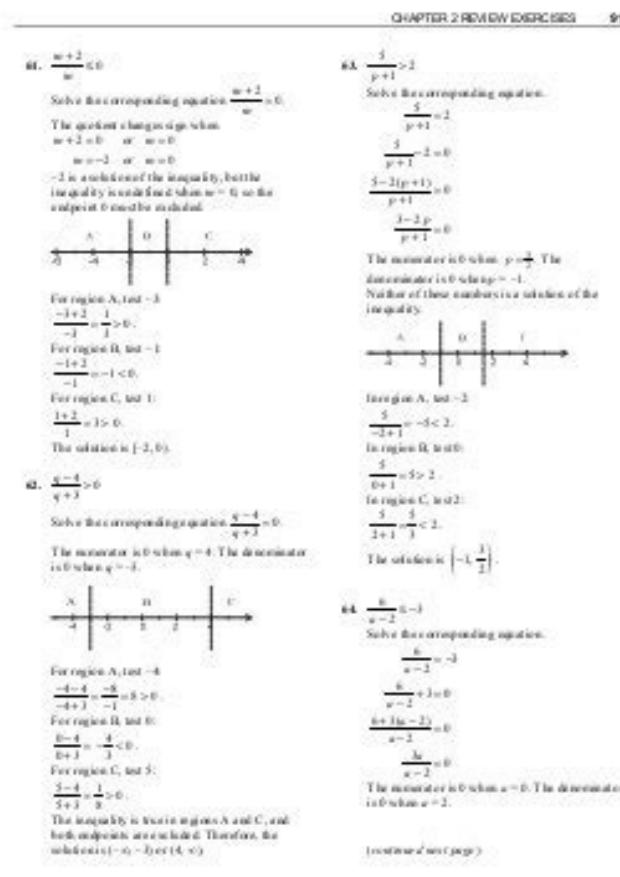
$-\frac{9}{5} \leq k \leq 1$

The solution is  $\left[-\frac{9}{5}, 1\right]$ .

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15. a. Using a graphing calculator, the regression-line model is  $y = 5.90x + 146.59$ .
- b. The year 2015 corresponds to  $x = 15$ . Using the regression-line model generated by a graphing calculator, we have  
 $y = 5.90(15) + 146.59 = 235.09$ , or about \$235 billion in sales.
16. a. Using a graphing calculator, we find that the linear model is  $y = -7.72x + 407.94$ .
- b. The year 2015 corresponds to  $x = 35$ . Using the regression-line model generated by a graphing calculator, we have  
 $y = -7.72(35) + 407.94 = 137.74$ , or about 137 deaths per 100,000 people from heart disease.
17. a. Using a graphing calculator, the regression-line model is  
 $y = -3.96x + 73.98$ .
- b. The year 2016 corresponds to  $x = 16$ . Using the regression-line model generated by a graphing calculator, we have  
 $y = -3.96(16) + 73.98 = 10.62$ , or about \$10.62 billion in revenue.
18. a. Using a graphing calculator, the regression-line model is  
 $y = 14.9x + 28.22$ .
- b. Using the regression-line model:  
Let  $x = 150$  feet squared.  
 $y = 14.9(150) + 28.22 = 5057$   
Let  $x = 280$  feet squared.  
 $y = 14.9(280) + 28.22 = 6994$   
Let  $x = 420$  feet squared.  
 $y = 14.9(420) + 28.22 = 9080$   
The predicted values are very close to the actual data values.
- c. Using the regression-line model:  
Let  $x = 215$  feet squared.  
 $y = 14.9(215) + 28.22 = 6323.5$   
Adam should choose the closest value above the requirement; therefore, Adam should choose the 6500 BTU air conditioner.
19. a. Using a graphing calculator, the regression-line model for estimated operating revenue (in billions of dollars) from internet publishing and broadcasting is given by  
 $y = 2.37x + 2.02$ .
- b. Let  $x = 12$  (2012).  
 $y = 2.37(12) + 2.02 = 26.42$  billion  
Let  $x = 14$  (2014).  
 $y = 2.37(14) + 2.02 = 31.16$  billion  
The operating revenue was about \$26.42 billion in 2012 and will be about \$31.16 billion in 2014.
20. a. Using a graphing calculator, the regression-line model is  
 $y = -0.62x + 68.28$ .
- b.  $y = -0.62(9) + 68.28 = 62.7$ . There were about 62.7 million subscribers in 2009.
- c. Let  $y = 55$ .  
 $55 = -0.62x + 68.28$   
 $-13.28 = -0.62x$   
 $x = 21.4$   
There will be 55 million subscribers in the year 2021.
- d. Using a graphing calculator, the coefficient of correlation is about  $-.915$ .
21. a. Using a graphing calculator, the regression-line model is  
 $y = -2.318x + 55.88$ .
- b.  $y = -2.318(6) + 55.88 = 41.972$ . There were about 41,972 traffic fatalities in 2006.
- c. Let  $y = 28$ .  
 $28 = -2.318x + 55.88$   
 $-27.88 = -2.318x$   
 $x = 12.03$   
There were 28,000 traffic fatalities in the year 2012.
- d. Using a graphing calculator, the coefficient of correlation is about  $-.972$ .
22. a. Using a graphing calculator, the regression-line model for men is  
 $y = .215x + 52.6$ .
- b. Using a graphing calculator, the regression-line model for women is  
 $y = .144x + 65.4$ .

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