63. Guidelines for solving word problems:

(a) Write a verbal model that will describe what you need to know.

(b) Assign labels to each part of the verbal model—numbers to the known quantities and letters to the variable quantities.

(c) Use the labels to write an algebraic model based on the verbal model.

(d) Solve the resulting algebraic equation and check your solution.

65. Unit Analysis

$$\frac{9 \text{ dollars}}{\cancel{\text{hour}}} \cdot (20 \cancel{\text{hours}}) = 180 \text{ dollars}$$

67. An example of a quadratic equation that has only one repeated solution is $(x + 4)^2 = 0$. Any equation of the form $(x - c)^2 = 0$, where c is a constant will have only one repeated solution.

Section 6.5 Quadratic and Rational Inequalities

1. $x(2x - 5) = 0$

$x = 0 \quad 2x - 5 = 0$

$x = \frac{5}{2}$

Critical numbers $= 0, \frac{5}{2}$

3. $4x^2 - 81 = 0$

$x^2 = \frac{81}{4}$

$x = \pm\frac{9}{2}$

Critical numbers: $\frac{9}{2}, -\frac{9}{2}$

5. $x(x + 3) - 5(x + 3) = 0$

$(x - 5)(x + 3) = 0$

$x = 5 \quad x = -3$

Critical numbers: $5, -3$

7. $x^2 - 4x + 3 = 0$

$(x - 3)(x - 1) = 0$

$x = 3 \quad x = 1$

Critical numbers $= 3, 1$

9. $4x^2 - 20x + 25 = 0$

$(2x - 5)^2 = 0$

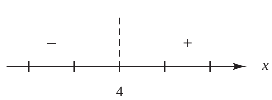
$2x - 5 = 0$

$x = \frac{5}{2}$

Critical number: $\frac{5}{2}$

11. Negative: $(-\infty, 4)$

Positive: $(4, \infty)$



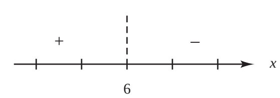
Choose a test value from each interval.

$(-\infty, 4) \implies x = 0 \implies 0 - 4 = -4 < 0$

$(4, \infty) \implies x = 5 \implies 5 - 4 = 1 > 0$

13. Negative: $(6, \infty)$

Positive: $(-\infty, 6)$



Choose a test value from each interval.

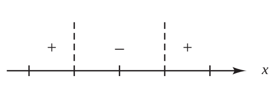
$(-\infty, 6) \implies x = 0 \implies 3 - \frac{1}{2}(0) = 3 > 0$

$(6, \infty) \implies x = 8 \implies 3 - \frac{1}{2}(8) = -1 < 0$

15. Positive: $(-\infty, 0)$

Negative: $(0, 4)$

Positive: $(4, \infty)$



Choose a test value from each interval.

$(-\infty, 0) \implies x = -1 \implies 2(-1)(-1 - 4) = 10 > 0$

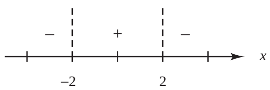
$(0, 4) \implies x = 1 \implies 2(1)(1 - 4) = -6 < 0$

$(4, \infty) \implies x = 5 \implies 2(5)(5 - 4) = 10 > 0$

17. $4 - x^2 = (2 - x)(2 + x)$

Negative: $(-\infty, -2) \cup (2, \infty)$

Positive: $(-2, 2)$



Choose a test value from each interval.

$(-\infty, -2) \implies x = -3 \implies (2-3)(2 + -3) = -5 < 0$

$(-2, 2) \implies x = 0 \implies (2 - 0)(2 + 0) = 4 > 0$

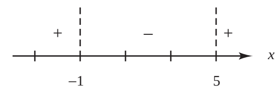
$(2, \infty) \implies x = 3 \implies (2 - 3)(2 + 3) = -5 < 0$

19. $(x - 5)(x + 1)$

Positive: $(-\infty, -1)$

Negative: $(-1, 5)$

Positive: $(5, \infty)$



Choose a test value from each interval.

$(-\infty, -1) \implies x = -2 \implies (-2 - 5)(-2 + 1) = 7 > 0$

$(-1, 5) \implies x = 0 \implies (0 - 5)(0 + 1) = -5 < 0$

$(5, \infty) \implies x = 6 \implies (6 - 5)(6 + 1) = 7 > 0$

21. $2(x + 3) \geq 0$

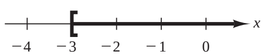
Critical number: $x = -3$

Test intervals:

Negative: $(-\infty, -3]$

Positive: $[-3, \infty)$

Solution: $[-3, \infty)$



23. $-\frac{3}{4}x + 6 < 0$

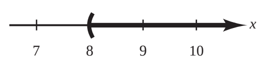
Critical number: $x = 8$

Test intervals:

Negative: $(8, \infty)$

Positive: $(-\infty, 8)$

Solution: $(8, \infty)$



25. $3x(x - 2) < 0$

Critical number: $x = 0, 2$

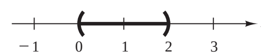
Test intervals:

Positive: $(-\infty, 0)$

Negative: $(0, 2)$

Positive: $(2, \infty)$

Solution: $(0, 2)$



27. $3x(2 - x) \geq 0$

Critical numbers: $x = 0, 2$

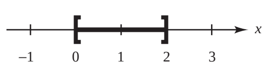
Test intervals:

Negative: $(-\infty, 0]$

Positive: $[0, 2]$

Negative: $[2, \infty)$

Solution: $[0, 2]$



29. $x^2 > 4$

$x^2 - 4 > 0$

$(x - 2)(x + 2) > 0$

Critical numbers: $x = 2, -2$

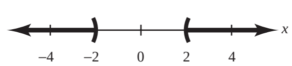
Test intervals:

Positive: $(-\infty, 2)$

Negative: $(-2, 2)$

Positive: $(2, \infty)$

Solution: $(-\infty, -2) \cup (2, \infty)$



31. $x^2 + 3x - 10 \leq 0$

$(x + 5)(x - 2) \leq 0$

Critical number: $x = -5, 2$

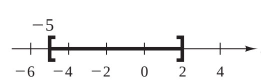
Test intervals:

Positive: $(-\infty, -5]$

Negative: $[-5, 2]$

Positive: $[2, \infty)$

Solution: $[-5, 2]$



33. $u^2 + 2u - 2 > 1$

$u^2 + 2u - 3 > 0$

$(u + 3)(u - 1) > 0$

Critical numbers: $u = -3, 1$

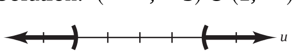
Test intervals:

Positive: $(-\infty, -3)$

Negative: $(-3, 1)$

Positive: $(1, \infty)$

Solution: $(-\infty, -3) \cup (1, \infty)$



35. $x^2 + 4x + 5 < 0$

$$x = \frac{-4 \pm \sqrt{16 - 20}}{2}$$

No critical numbers

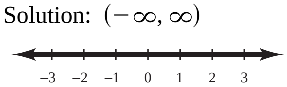
$x^2 + 4x + 5$ is not less than zero for any value of x.

Solution: none

37. $(x + 1)^2 \geq 0$

$(x + 1)^2 \geq 0$ for all real numbers

Solution: $(-\infty, \infty)$



39. $x^2 - 4x + 2 > 0$

$x = \dfrac{4 \pm \sqrt{16 - 8}}{2}$

$= \dfrac{4 \pm \sqrt{8}}{2} = \dfrac{4 \pm 2\sqrt{2}}{2}$

$= 2 \pm \sqrt{2}$

Critical numbers: $x = 2 + \sqrt{2}, 2 - \sqrt{2}$

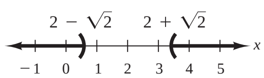
Test intervals:

Positive: $(-\infty, 2 - \sqrt{2})$

Negative: $(2 - \sqrt{2}, 2 + \sqrt{2})$

Positive: $(2 + \sqrt{2}, \infty)$

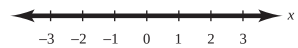
Solution: $(-\infty, 2 - \sqrt{2}) \cup (2 + \sqrt{2}, \infty)$



41. $x^2 - 6x + 9 \geq 0$

$(x - 3)^2 \geq 0$

$(x - 3)^2 \geq 0$ for all real numbers



43. $u^2 - 10u + 25 < 0$

$(u - 5)(u - 5) < 0$

Critical number: $u = 5$

Test intervals:

Positive: $(-\infty, 5)$

Positive: $(5, \infty)$

Solution: none

45. $3x^2 + 2x - 8 \leq 0$

$(3x - 4)(x + 2) \leq 0$

Critical numbers: $x = \frac{4}{3}, -2$

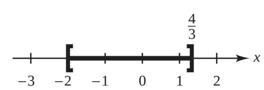
Test intervals:

Positive: $(-\infty, -2]$

Negative: $\left[-2, \frac{4}{3}\right]$

Positive: $\left[\frac{4}{3}, \infty\right)$

Solution: $\left[-2, \frac{4}{3}\right]$



47. $-6u^2 + 19u - 10 > 0$

$6u^2 - 19u + 10 < 0$ (Multiply by -1)

$(3u - 2)(2u - 5) < 0$

Critical numbers: $u = \frac{2}{3}, \frac{5}{2}$

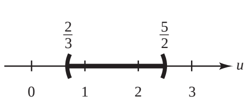
Test intervals:

Positive: $\left(-\infty, \frac{2}{3}\right)$

Negative: $\left(\frac{2}{3}, \frac{5}{2}\right)$

Positive: $\left(\frac{5}{2}, \infty\right)$

Solution: $\left(\frac{2}{3}, \frac{5}{2}\right)$



49. $2u^2 - 7u - 4 > 0$

$(2u + 1)(u - 4) > 0$

Critical numbers: $u = -\frac{1}{2}, 4$

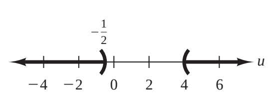
Test intervals:

Positive: $\left(-\infty, -\frac{1}{2}\right)$

Negative: $\left(-\frac{1}{2}, 4\right)$

Positive: $(4, \infty)$

Solution: $\left(-\infty, -\frac{1}{2}\right) \cup (4, \infty)$



51. $4x^2 + 28x + 49 \le 0$

$(2x + 7)(2x + 7) \le 0$

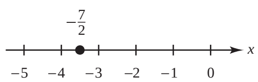
Critical number: $x = \frac{-7}{2}$

Test intervals:

Positive: $\left(-\infty, -\frac{7}{2}\right)$

Positive: $\left(-\frac{7}{2}, \infty\right)$

Solution: $-\frac{7}{2}$



53. $(x - 5)^2 > 0$ for all real numbers except 5.

Solution: none

55. $6 - (x^2 - 10x + 25) < 0$

$6 - x^2 + 10x - 25 < 0$

$x^2 - 10x + 19 > 0$

$$x = \frac{10 \pm \sqrt{100 - 76}}{2}$$

$$= \frac{10 \pm \sqrt{24}}{2} = \frac{10 \pm 2\sqrt{6}}{2}$$

$$= 5 \pm \sqrt{6}$$

Critical numbers: $x = 5 + \sqrt{6}, 5 - \sqrt{6}$

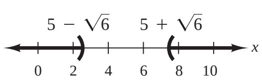
Test intervals:

Positive: $\left(-\infty, 5 - \sqrt{6}\right)$

Negative: $\left(5 - \sqrt{6}, 5 + \sqrt{6}\right)$

Positive: $\left(5 + \sqrt{6}, \infty\right)$

Solution: $\left(-\infty, 5 - \sqrt{6}\right) \cup \left(5 + \sqrt{6}, \infty\right)$



57. $16 \le (u + 5)^2$

$(u + 5)^2 \ge 16$

$u^2 + 10u + 25 - 16 \ge 0$

$u^2 + 10u + 9 \ge 0$

$(u + 9)(u + 1) \ge 0$

Critical numbers: $x = -9, -1$

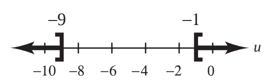
Test intervals:

Positive: $(-\infty, -9]$

Negative: $(-9, -1]$

Positive: $[-1, \infty)$

Solution: $(-\infty, -9] \cup [-1, \infty)$



59. $x(x - 2)(x + 2) > 0$

Critical numbers: $x = 0, 2, -2$

Test intervals:

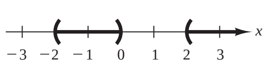
Negative: $(-\infty, -2)$

Positive: $(-2, 0)$

Negative: $(0, 2)$

Positive: $(2, \infty)$

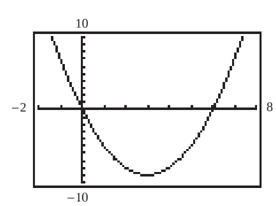
Solution: $(-2, 0) \cup (2, \infty)$



61. *Keystrokes:*

[Y=] [X,T,θ] [x²] [−] 6 [X,T,θ] [GRAPH]

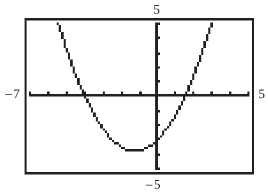
(0, 6)



63. *Keystrokes:*

[Y=] 0.5 [X,T,θ] [x²] [+] 1.25 [X,T,θ] [−] 3 [GRAPH]

$(-\infty, -4) \cup \left(\frac{3}{2}, \infty\right)$

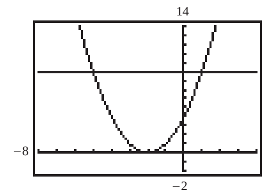


65. *Keystrokes:*

y_1 [Y=] [X,T,θ] [x²] [+] 4 [X,T,θ] [+] 4 [ENTER]

y_2 9 [GRAPH]

$(-\infty, -5] \cup [1, \infty)$

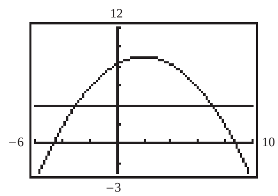


67. *Keystrokes:*

y_1 [Y=] 9 [−] 0.2 [(] [X,T,θ] [−] 2 [)] [x²]

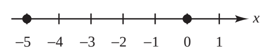
y_2 4 [GRAPH]

$(-\infty, -3) \cup (7, \infty)$



69. Critical number: $x = 3$

71. Critical numbers: $x = 0, -5$



73. $\dfrac{5}{x-3} > 0$

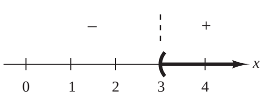
Critical number: $x = 3$

Test intervals:

Negative: $(-\infty, 3)$

Positive: $(3, \infty)$

Solution: $(3, \infty)$



75. $\dfrac{-5}{x-3} > 0$

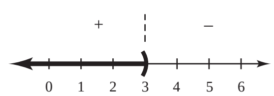
Critical number: $x = 3$

Test intervals:

Positive: $(-\infty, 3)$

Negative: $(3, \infty)$

Solution: $(-\infty, 3)$



77. $\dfrac{x}{x-3} < 0$

Critical numbers: $x = 0, 3$

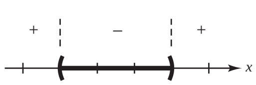
Test intervals:

Positive: $(-\infty, 0)$

Negative: $(0, 3)$

Positive: $(3, \infty)$

Solution: $(0, 3)$



79. $\dfrac{x+3}{x-4} \le 0$

Critical numbers: $x = -3, 4$

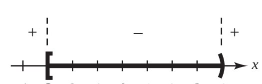
Test intervals:

Positive: $(-\infty, -3]$

Negative: $[-3, 4)$

Positive: $(4, \infty)$

Solution: $[-3, 4)$



81. $\dfrac{y-4}{y+6} < 0$

Critical numbers: $y = 4, -6$

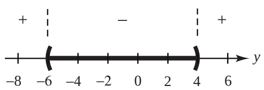
Test intervals:

Positive: $(-\infty, -6)$

Negative: $(-6, 4)$

Positive: $(4, \infty)$

Solution: $(-6, 4)$



83. $\dfrac{y-3}{y-11} \geq 0$

Critical numbers: $y = 3, \dfrac{11}{2}$

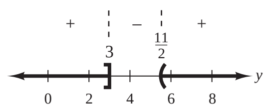
Test intervals:

Positive: $(-\infty, 3]$

Negative: $\left[3, \dfrac{11}{2}\right)$

Positive: $\left(\dfrac{11}{2}, \infty\right)$

Solution: $(-\infty, 3] \cup \left(\dfrac{11}{2}, \infty\right)$



85. $\dfrac{x+2}{4x+6} \leq 0$

Critical numbers: $x = -2, -\dfrac{3}{2}$

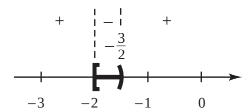
Test intervals:

Positive: $(-\infty, -2]$

Negative: $\left[-2, -\dfrac{3}{2}\right)$

Positive: $\left(-\dfrac{3}{2}, \infty\right)$

Solution: $\left[-2, -\dfrac{3}{2}\right)$



87. $\dfrac{3(u-3)}{u+1} < 0$

Critical numbers: $u = 3, -1$

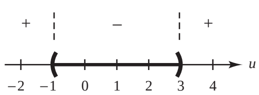
Test intervals:

Positive: $(-\infty, -1)$

Negative: $(-1, 3)$

Positive: $(3, \infty)$

Solution: $(-1, 3)$



89.

$$\frac{6}{x-4} > 2$$
$$\frac{6}{x-4} - 2 > 0$$
$$\frac{6-2(x-4)}{x-4} > 0$$
$$\frac{6-2x+8}{x-4} > 0$$
$$\frac{14-2x}{x-4} > 0$$
$$\frac{-2(-7+x)}{x-4} > 0$$

Critical numbers: $x = 7, 4$

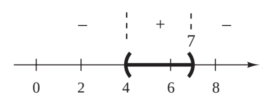
Test intervals:

Negative: $(-\infty, 4)$

Positive: $(4, 7)$

Negative: $(7, \infty)$

Solution: $(4, 7)$



91.

$$\frac{4x}{x+2} < -1$$
$$\frac{4x}{x+2} + 1 < 0$$
$$\frac{4x+(x+2)}{x+2} < 0$$
$$\frac{5x+2}{x+2} < 0$$

Critical numbers: $x = -\dfrac{2}{5}, -2$

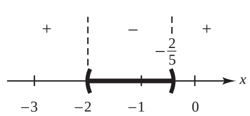
Test intervals:

Positive: $(-\infty, -2)$

Negative: $\left(-2, -\dfrac{2}{5}\right)$

Positive: $\left(-\dfrac{2}{5}, \infty\right)$

Solution: $\left(-2, -\dfrac{2}{5}\right)$



93.

$$\frac{x-1}{x-3} \leq 2$$
$$\frac{x-1}{x-3} - 2 \leq 0$$
$$\frac{x-1-2(x-3)}{x-3} \leq 0$$
$$\frac{x-1-2x+6}{x-3} \leq 0$$
$$\frac{-x+5}{x-3} \leq 0$$

Critical numbers: $x = 5, 3$

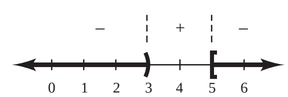
Test intervals:

Negative: $(-\infty, 3)$

Positive: $(3, 5]$

Negative: $[5, \infty)$

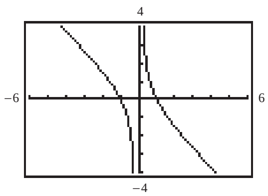
Solution: $(-\infty, 3) \cup [5, \infty)$



95. *Keystrokes:*

[Y=] 1 [÷] [X,T,θ] [−] [X,T,θ] [GRAPH]

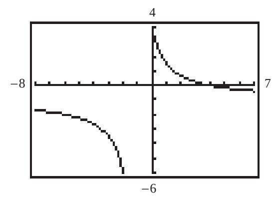
Solution: $(-\infty, -1) \cup (0, 1)$



97. *Keystrokes:*

[Y=] [(] [X,T,θ] [+] 6 [)] [÷] [(] [X,T,θ] [+] 1 [)] [−] 2 [GRAPH]

Solution: $(-\infty, -1) \cup (4, \infty)$

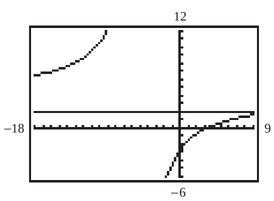


99. *Keystrokes:*

y_1 [Y=] [(] 6 [X,T,θ] [−] 3 [)] [÷] [(] [X,T,θ] [+] 5 [)] [ENTER]

y_2 2 [GRAPH]

Solution: $(-5, 3.25)$

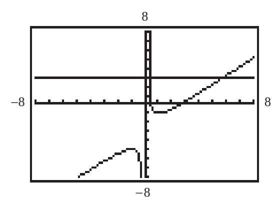


101. *Keystrokes:*

y_1 [Y=] [X,T,θ] [+] 1 [÷] [X,T,θ] [ENTER]

y_2 3 [GRAPH]

Solution: $(0, 0.382) \cup (2.618, \infty)$



103. *Keystrokes:*

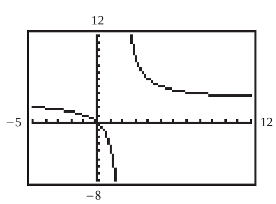
[Y=] 3 [X,T,θ] ÷ [(] [X,T,θ] [−] 2 [GRAPH]

(a) Solution $[0, 2)$

(Look at x-axis and vertical asymptote $x = 2$)

(b) $(2, 4]$

(Graph $y = 6$ as y_2 and find the intersection.)



105. *Keystrokes:*

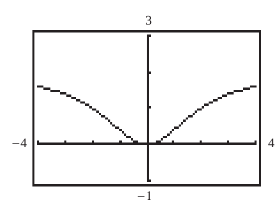
[Y=] 2 [X,T,θ] [x^2] [÷] [(] [X,T,θ] [x^2] [+] 4 [)] [GRAPH]

(a) Solution: $(-\infty, -2] \cup [2, \infty)$

(Graph $y = 1$ as y_2 and find the intersection.)

(b) Solution $(-\infty, \infty)$

(Notice graph stays below line $y = 2$.)



107.

$$\begin{aligned} \text{height} &> 240 \\ -16t^2 + 128t &> 240 \\ -16t^2 + 128t - 240 &> 0 \\ t^2 - 8t + 15 &< 0 \\ (t-3)(t-5) &< 0 \end{aligned}$$

Critical numbers: $x = 3, 5$

Test intervals:

Positive: $(-\infty, 3)$

Negative: $(3, 5)$

Positive: $(5, \infty)$

Solution: $(3, 5)$

109.

$$1000(1 + r)^2 > 1150$$
$$1000(1 + 2r + r^2) > 1150$$
$$1000 + 2000r + 1000r^2 > 1150$$
$$1000r^2 + 2000r - 150 > 0$$
$$20r^2 + 40r - 3 > 0$$

Critical numbers: $r = \dfrac{-40 + \sqrt{1840}}{40}, \dfrac{-40 - \sqrt{1840}}{40}$

r cannot be negative.

Test intervals:

Negative: $\left(0, \dfrac{-40 + \sqrt{1840}}{40}\right)$

Positive: $\left(\dfrac{-40 + \sqrt{1840}}{40}, \infty\right)$

Solution: $\left(\dfrac{-40 + \sqrt{1840}}{40}, \infty\right)$

$(0.0724, \infty)$, $r > 7.24\%$

111. *Verbal model:* [Profit] $> 1{,}650{,}000$

[Revenue] − [Cost] = Profit $> 1{,}650{,}000$

$$x(50 - 0.0002x) - [12x + 150{,}000] > 1{,}650{,}000$$
$$50x - 0.0002x^2 - 12x - 150{,}000 > 1{,}650{,}000$$
$$-0.0002x^2 + 38x - 150{,}000 > 1{,}650{,}000$$
$$0 > 0.0002x^2 - 38x + 1{,}800{,}000$$
$$0 > (0.0002x - 20)(x - 90{,}000)$$

Critical numbers: 90,000, 100,000

Test intervals:

Positive: $(0, 90{,}000)$

Negative: $(90{,}000, 100{,}000)$

Positive: $(100{,}000, \infty)$

Solution: $(90{,}000, 100{,}000)$

$90{,}000 \le x \le 100{,}000$ units

113.

$$\text{Area} > 240$$
$$l(32 - l) > 240$$
$$32l - l^2 > 240$$
$$-l^2 + 32l - 240 > 0$$
$$l^2 - 32l + 240 < 0$$
$$(l - 20)(l - 12) < 0$$

Critical numbers: $l = 20, 12$

Test intervals:

Positive: $(-\infty, 12)$

Negative: $(12, 20)$

Positive: $(20, \infty)$

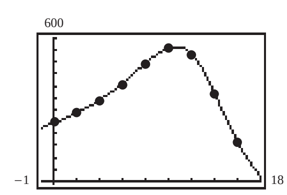
Solution: $(12, 20)$

115. (a) *Keystrokes:*

[Y=] [(] 244.20 [−] 13.23 [X,T,θ] [)] [÷] [(] 1 [−] .13 [X,T,θ] [+] .005 [X,T,θ] [x²] [)] [GRAPH]

(b) Let $y_2 = 400$ and find the intersection of the graphs.

Solution: $[5.7, 13.7]$, $5.7 \le t \le 13 \cdot 7$



117. The direction of the inequality is reversed, when both sides are multiplied by a negative real number.

119. A polynomial can change signs only at the x-values that make the polynomial zero. The zeros of the polynomial are called the ciritical numbers, and they are used ro determine the test intervals in solving polynomial inequalities.

121. $x^2 + 1 < 0$ is one example of a quadratic inequality that has no real solution. Any inequality of the form $x^2 + c < 0$, c any positive constant or $-x^2 - c > 0$, c any positive constant will not have a real solution.

Review Exercises for Chapter 6

1. $x^2 + 12x = 0$

$x(x + 12) = 0$

$x = 0 \qquad x + 12 = 0$

$x = 0 \qquad x = -12$

3. $4y^2 - 1 = 0$

$(2y - 1)(2y + 1) = 0$

$2y - 1 = 0 \qquad 2y + 1 = 0$

$y = \frac{1}{2} \qquad y = -\frac{1}{2}$

5. $4y^2 + 20y + 25 = 0$

$(2y + 5)(2y + 5) = 0$

$2y + 5 = 0 \qquad 2y + 5 = 0$

$2y = -5 \qquad 2y = -5$

$y = -\frac{5}{2} \qquad y = -\frac{5}{2}$

7. $2x^2 - 2x - 180 = 0$

$2(x^2 - x - 90) = 0$

$2(x - 10)(x + 9) = 0$

$x - 10 = 0 \qquad x + 9 = 0$

$x = 10 \qquad x = -9$

9. $6x^2 - 12x = 4x^2 - 3x + 18$

$2x^2 - 9x - 18 = 0$

$(2x + 3)(x - 6) = 0$

$x = -\frac{3}{2} \qquad x = 6$

11. $4x^2 = 10{,}000$

$x^2 = 2500$

$x = \pm\sqrt{2500}$

$x = \pm 50$

13. $y^2 - 12 = 0$

$y^2 = 12$

$y = \pm\sqrt{12}$

$y = \pm 2\sqrt{3}$

15. $(x - 16)^2 = 400$

$x - 16 = \pm\sqrt{400}$

$x = 16 \pm 20$

$x = 36, -4$

17. $z^2 = -121$

$z = \pm\sqrt{-121}$

$z = \pm 11i$

19. $y^2 + 50 = 0$

$y^2 = -50$

$y = \pm\sqrt{-50}$

$y = \pm 5\sqrt{2}i$

21. $(y + 4)^2 + 18 = 0$

$(y + 4)^2 = -18$

$y + 4 = \pm\sqrt{-18}$

$y = -4 \pm 3\sqrt{2}i$

23. $x^4 - 4x^2 - 5 = 0$

$(x^2 - 5)(x^2 + 1) = 0$

$x^2 + 1 = 0$

$x^2 - 5 = 0 \qquad x^2 = -1$

$x^2 = 5 \qquad x = \pm\sqrt{-1}$

$x = \pm\sqrt{5} \qquad x = \pm i$

25. $x - 4\sqrt{x} + 3 = 0$

$(\sqrt{x} - 3)(\sqrt{x} - 1) = 0$

$(\sqrt{x} - 3) = 0 \qquad (\sqrt{x} - 1) = 0$

$\sqrt{x} = 3 \qquad \sqrt{x} = 1$

$(\sqrt{x})^2 = 3^2 \qquad (\sqrt{x})^2 = 1^2$

$x = 9 \qquad x = 1$

Check:

$9 - 4\sqrt{9} + 3 \stackrel{?}{=} 0$

$9 - 12 + 3 \stackrel{?}{=} 0$

$0 = 0$

Check:

$1 - 4\sqrt{1} + 3 \stackrel{?}{=} 0$

$1 - 4 + 3 \stackrel{?}{=} 0$

$0 = 0$