

83. $h = -16t^2 + 312t$

$$-16t^2 + 312t > 1200$$

$$-16t^2 + 312t - 1200 > 0 \quad (\text{Divide by } -16)$$

$$t^2 - 19.5t + 75 < 0$$

$$t = \frac{-(-19.5) \pm \sqrt{(-19.5)^2 - 4(1)(75)}}{2(1)}$$

$$t = \frac{19.5 \pm \sqrt{80.25}}{2}$$

$$t \approx 14.2, 5.3$$

Critical numbers: $t = 14.2, 5.3$

Test intervals:

Positive: $(-\infty, 5.3)$ Negative: $(5.3, 14.2)$ Positive: $(14.2, \infty)$ Solution: $(5.3, 14.2)$

$$5.3 < t < 14.2$$

Chapter Test for Chapter 6

1. $x(x + 5) - 10(x + 5) = 0$

$$(x + 5)(x - 10) = 0$$

$$x + 5 = 0 \quad x - 10 = 0$$

$$x = -5 \quad x = 10$$

2. $8x^2 - 21x - 9 = 0$

$$(8x + 3)(x - 3) = 0$$

$$8x + 3 = 0 \quad x - 3 = 0$$

$$x = -\frac{3}{8} \quad x = 3$$

3. $(x - 2)^2 = 0.09$

$$x - 2 = \pm 0.3$$

$$x = 2 \pm 0.3$$

$$x = 2.3, 1.7$$

4. $(x + 3)^2 + 81 = 0$

$$(x + 3)^2 = -81$$

$$x + 3 = \pm \sqrt{-81}$$

$$x = -3 \pm 9i$$

5. $2x^2 - 6x + 3 = 0$

$$x^2 - 3x + \frac{9}{4} = -\frac{3}{2} + \frac{9}{4}$$

$$\left(x - \frac{3}{2}\right)^2 = \frac{-6 + 9}{4}$$

$$\left(x - \frac{3}{2}\right)^2 = \frac{3}{4}$$

$$x - \frac{3}{2} = \pm \sqrt{\frac{3}{4}}$$

$$x = \frac{3}{2} \pm \frac{\sqrt{3}}{2}$$

6. $2y(y - 2) = 7$

$$2y^2 - 4y - 7 = 0$$

$$y = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(-7)}}{2(2)}$$

$$y = \frac{4 \pm \sqrt{16 + 56}}{4}$$

$$y = \frac{4 \pm \sqrt{72}}{4}$$

$$y = \frac{4 \pm 6\sqrt{2}}{4}$$

$$y = \frac{2 \pm 3\sqrt{2}}{2} \approx 7.41 \text{ and } -0.41$$

7. $x - 5\sqrt{x} + 4 = 0$

$(\sqrt{x} - 4)(\sqrt{x} - 1) = 0$

$\sqrt{x} - 4 = 0 \quad \sqrt{x} - 1 = 0$

$\sqrt{x} = 4 \quad \sqrt{x} = 1$

$(\sqrt{x})^2 = 4^2 \quad (\sqrt{x})^2 = 1^2$

$x = 16 \quad x = 1$

Check:

$16 - 5\sqrt{16} + 4 \stackrel{?}{=} 0$

$16 - 20 + 4 \stackrel{?}{=} 0$

$0 = 0$

$5x^2 - 12x + 10 = 0$

Check:

$1 - 5\sqrt{1} + 4 \stackrel{?}{=} 0$

$1 - 5 + 4 \stackrel{?}{=} 0$

$0 = 0$

8. $x^4 + 6x^2 - 16 = 0$

$(x^2 + 8)(x^2 - 2) = 0$

$x^2 + 8 = 0 \quad x^2 - 2 = 0$

$x^2 = -8 \quad x^2 = 2$

$x = \pm\sqrt{-8} \quad x = \pm\sqrt{2}$

$x = \pm 2\sqrt{2}i$

9. $b^2 - 4ac = (-12)^2 - 4(5)(10)$

$= 144 - 200$

$= -56$

2 imaginary solutions.

10. $(x - (-4))(x - 5) = 0$

$(x + 4)(x - 5) = 0$

$x^2 - x - 20 = 0$

11. $16 \leq (x - 2)^2$

$(x - 2)^2 \geq 16$

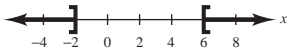
$x^2 - 4x + 4 \geq 16$

$x^2 - 4x - 12 \geq 0$

$(x - 6)(x + 2) \geq 0$

Critical numbers: $x = -2, 6$

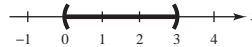
Test intervals:

Positive: $(-\infty, -2]$ Negative: $[-2, 6]$ Positive: $[6, \infty)$ Solution: $(-\infty, -2] \cup [6, \infty)$ 

12. $2x(x - 3) < 0$

Critical numbers: $x = 0, 3$

Test intervals:

Positive: $(-\infty, 0)$ Negative: $(0, 3)$ Positive: $(3, \infty)$ Solution: $(0, 3)$ 

$$13. \quad \frac{3u+2}{u-3} \leq 2 \quad \text{Critical numbers: } u = -8, 3$$

$$\frac{3u+2}{u-3} - \frac{2(u-3)}{u-3} \leq 0$$

$$\frac{3u+2-2u+6}{u-3} \leq 0$$

$$\frac{u+8}{u-3} \leq 0$$

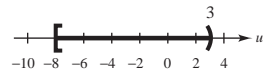
Test intervals:

Positive: $(-\infty, -8]$

Negative: $[-8, 3)$

Positive: $(3, \infty)$

Solution: $[-8, 3)$



$$14. \quad \frac{3}{x-2} > 4 \quad \text{Critical numbers: } x = \frac{11}{4}, 2$$

$$\frac{3}{x-2} - 4 > 0$$

$$\frac{3-4(x-2)}{x-2} > 0$$

$$\frac{3-4x+8}{x-2} > 0$$

$$\frac{11-4x}{x-2} > 0$$

$$\frac{-1(4x-11)}{x-2} > 0$$

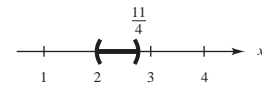
Test intervals:

Negative: $(-\infty, 2)$

Positive: $(2, \frac{11}{4})$

Negative: $(\frac{11}{4}, \infty)$

Solution: $(2, \frac{11}{4})$



$$15. \text{ Verbal model: } \boxed{\text{Area}} = \boxed{\text{Length}} \cdot \boxed{\text{Width}}$$

Labels: Length = l

Width = $l - 8$

$$\text{Equation: } 240 = l \cdot (l - 8)$$

$$0 = l^2 - 8l - 240$$

$$0 = (l - 20)(l + 12)$$

$$0 = l - 20 \quad 0 = l + 12$$

$$20 \text{ feet} = l \quad -12 = l \text{ reject}$$

$$12 \text{ feet} = l - 8$$

$$16. \text{ Verbal model: } \boxed{\text{Cost per person Current Group}} - \boxed{\text{Cost per person New Group}} = 6.25$$

Labels: Number Current Group = x

Number New Group = $x + 10$

$$\text{Equation: } \frac{1250}{x} - \frac{1250}{x+10} = 6.25$$

$$x(x+10)\left(\frac{1250}{x} - \frac{1250}{x+10}\right) = (6.25)x(x+10)$$

$$1250(x+10) - 1250x = 6.25x(x+10)$$

$$1250x + 12500 - 1250x = 6.25x^2 + 62.5x$$

$$0 = 6.25x^2 + 62.5x - 12500$$

$$0 = x^2 + 10x - 2000$$

$$0 = (x+50)(x-40)$$

$$\text{reject } x = -50 \quad x = 40 \text{ club members}$$

17. $35 = -16t^2 + 75$

$$16t^2 = 40$$

$$t^2 = \frac{40}{16} = \frac{5}{2}$$

$$t = \sqrt{\frac{5}{2}}$$

$$t = \frac{\sqrt{10}}{2} \approx 1.5811388$$

$$t \approx 1.58 \text{ seconds}$$

19. $h = -16t^2 + 288t$

$$-16t^2 + 288t > 1040$$

$$-16t^2 + 288t - 1040 > 0 \quad (\text{Divide by } -16)$$

$$t^2 - 18t + 65 < 0$$

$$(t - 5)(t - 13) < 0$$

18. $R = -\frac{1}{20}(n^2 - 240n), 80 \leq n \leq 160$

$$R = -\frac{1}{20}(n^2 - 240n + 14,400) + 720$$

$$R = -\frac{1}{20}(n - 120)^2 + 720$$

$n = 120$ passengers will produce a maximum revenue

Critical numbers: $t = 5, 13$

Test intervals:

t must be positive

Positive: $(0, 5)$

Negative: $(5, 13)$

Positive: $(13, \infty)$

Solution: $(5, 13)$

$5 < t < 13$ seconds

Cumulative Test for Chapters 4–6

1.
$$\left(\frac{2x^{-4}y^3}{3x^5y^{-3}z^0}\right)^{-2} = \left(\frac{2x^{(-4)+(-5)}y^{3+(3)}}{3}\right)^{-2}$$

$$= \left(\frac{2x^{-9}y^6}{3}\right)^{-2} = \left(\frac{2y^6}{3x^9}\right)^{-2} = \left(\frac{3x^9}{2y^6}\right)^2$$

$$= \frac{9x^{18}}{4y^{12}}$$

2. $(4 \times 10^3)^2 = 4^2 \times 10^6 = 16 \times 10^6 = 1.6 \times 10^7$

3.
$$\frac{2x^3 - 2x^2 - x + \frac{-4}{2x - 1}}{2x - 1} \begin{array}{r} 4x^4 - 6x^3 + 0x^2 + x - 4 \\ \underline{4x^4 - 2x^3} \\ -4x^3 + 0x^2 \\ \underline{-4x^3 + 2x^2} \\ -2x^2 + x \\ \underline{-2x^2 + x} \\ -4 \end{array}$$