Section 1.6.

1. $[-1,5] = \{x \in \mathbb{R} \mid -1 \le x \le 5\}$ bounded.

2. $(2,10] = \{x \in \mathbb{R} \mid 2 < x \le 10\}$ bounded

3. $(11,\infty) = \{x \in \mathbb{R} \mid x > 11\}$ unbounded

4. $[-5,\infty) = \{x \in \mathbb{R} \mid x \ge -5\}$ unbounded

5. $(-\infty,-2) = \{x \in \mathbb{R} \mid x < -2\}$ unbounded.

6. $(-\infty,7] = \{x \in \mathbb{R} \mid x \le 7\}$ unbounded

7. c
8. h
9. f
10. e
11. g
12. a
13. b
14. d

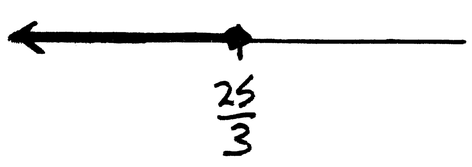
42. $2(x+7)-4 \ge 5(x-3)$

$2x+14-4 \ge 5x-15$

$2x+10 \ge 5x-15$

$-3x \ge -25$

$x \le \frac{25}{3}$



$(-\infty, \frac{25}{3})$

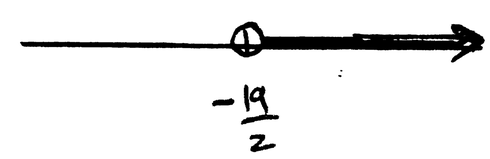
44. $5-3x > -5(x+4)+6$

$5-3x > -5x-20+6$

$5-3x > -5x-14$

$2x > -19$

$x > -\frac{19}{2}$

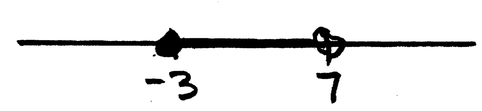


$(-\frac{19}{2}, \infty)$

50. $0 \le \frac{x+3}{2} < 5$

$0 \le x+3 < 10$

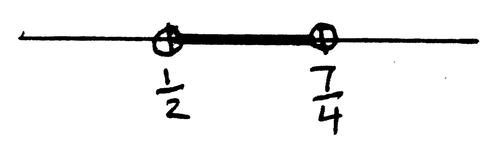
$-3 \le x < 7$



$[-3, 7)$

52. $-\frac{1}{2} < x-1 < \frac{3}{4}$

$\frac{1}{2} < x < \frac{7}{4}$



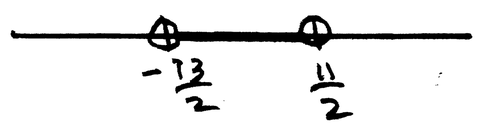
66. $\left|\frac{2x+1}{2}\right| < 6$

$-6 < \frac{2x+1}{2} < 6$

$-12 < 2x+1 < 12$

$-13 < 2x < 11$

$-\frac{13}{2} < x < \frac{11}{2}$



70. $2|5-3x|+7 < 21$

We must get this into standard form first.

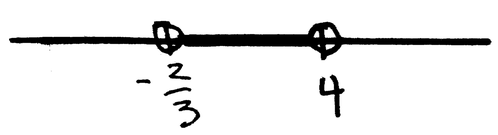
$2|5-3x| < 14$

$|5-3x| < 7$

$-7 < 5-3x < 7$

$-12 < -3x < 2$

$-\frac{2}{3} < x < 4$



88. $34800 + 1500t \geq 45000$

$1500t \geq 10200$

$t \geq 6.8$

7 years.

note that upon the raise in year 7 the salary will be:

$34800 + 1500(7) = 45300$

102. $C = 1.45n + 165$

$R = 7.95n$

$P = R - C$

$= 7.95n - (1.45n + 165)$

$P = 6.50n - 165$

$400 \leq 6.50n - 165 \leq 1200$

$565 \leq 6.50n \leq 1365$

$87 \leq n \leq 210$

Section 1.7

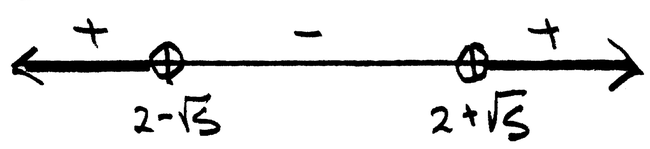
20. $x^2-4x-1>0$

$x = \frac{4 \pm \sqrt{16-4(1)(-1)}}{2}$

$= \frac{4 \pm \sqrt{20}}{2}$

$x = 2 \pm \sqrt{5}$

$[x-(2+\sqrt{5})][x-(2-\sqrt{5})] > 0$



	$x-(2+\sqrt{5})$	$x-(2-\sqrt{5})$	
-10	−	−	+
0	−	+	−
10	+	+	+

$(-\infty, 2-\sqrt{5}) \cup (2+\sqrt{5}, \infty)$

21. $x^2-8x+16>0$

$(x-4)^2>0$

The LHS is always ≥ 0.
We just need to eliminate 0 since this is just $>$.

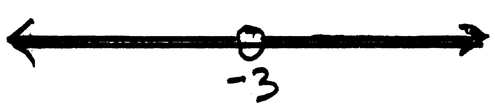
$x \neq 4$

$(-\infty, 4) \cup (4, \infty)$

22. $x^2+6x+9>0$

$(x+3)^2>0$

$x \neq -3$



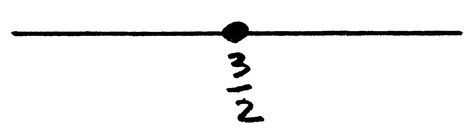
$(-\infty, 3) \cup (3, \infty)$

24. $4x^2+12x+9 \leq 0$

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

$(2x+3)^2 \leq 0$

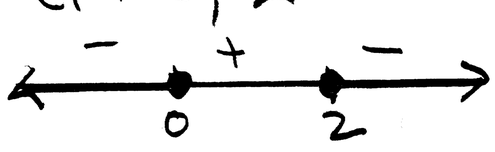
$x = -\frac{3}{2}$ only!



32. $2x^3-x^4 \leq 0$

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

CP: 0, 2



	x^3	$2-x$	
-1	−	+	−
1	+	+	+
3	+	−	−

38. $\frac{x+12}{x+2} \geq 3$

$\frac{x+12}{x+2} - 3 \geq 0$

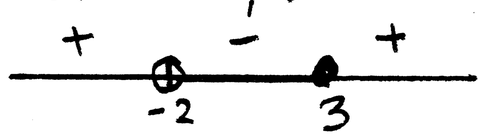
$\frac{x+12-3(x+2)}{x+2} \geq 0$

$\frac{-2x+6}{x+2} \geq 0$

$\frac{-2(x-3)}{x+2} \geq 0$

$\frac{x-3}{x+2} \leq 0$

CP: $-2, 3$



	$x-3$	$x+2$	
-3	−	−	+
0	−	+	−
4	+	+	+

$(-2, 3]$

40. $\frac{5+7x}{1+2x} < 4$

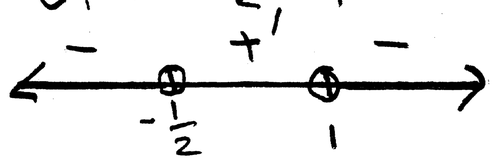
$\frac{5+7x}{1+2x} - 4 < 0$

$\frac{5+7x-4(1+2x)}{1+2x} < 0$

$\frac{5+7x-4-8x}{1+2x} < 0$

$\frac{1-x}{1+2x} < 0$

CP: $-\frac{1}{2}, 1$



	$1-x$	$1+2x$	
-1	+	−	−
0	+	+	+
2	−	+	−

$(-\infty, -\frac{1}{2}) \cup (1, \infty)$

42. $\frac{5}{x-6} > \frac{3}{x+2}$

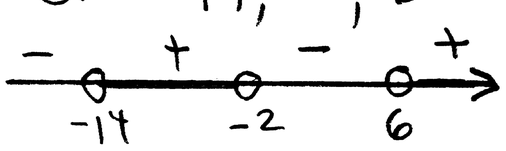
$\frac{5}{x-6} - \frac{3}{x+2} > 0$

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

$\frac{2x+28}{(x-6)(x+2)} > 0$

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

CP: $-14, -2, 6$



	$x+14$	$x+2$	$x-6$	
-15	−	−	−	−
-5	+	−	−	+
0	+	+	−	−
7	+	+	+	+

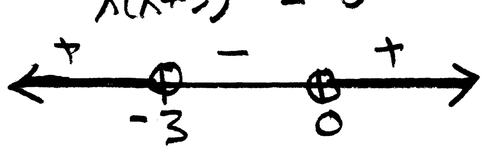
$(-14, -2) \cup (6, \infty)$

44. $\frac{1}{x} \geq \frac{1}{x+3}$

$\frac{1}{x} - \frac{1}{x+3} \geq 0$

$\frac{x+3-x}{x(x+3)} \geq 0$

$\frac{3}{x(x+3)} \geq 0$



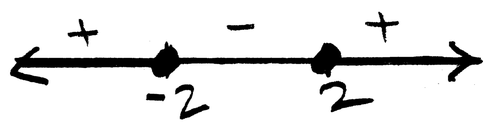
	x	$x+3$	
-4	−	−	+
-2	−	+	−
1	+	+	+

$(-\infty, -3) \cup (0, \infty)$

46. $y = \sqrt{x^2-4}$

$x^2 - 4 \geq 0$

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



$(-\infty, -2] \cup [2, \infty)$

	$x-2$	$x+2$	
-3	$-$	$-$	$+$
0	$-$	$+$	$-$
3	$+$	$+$	$+$

48. $y = \sqrt{x^2+4}$

$x^2 + 4 \geq 0$

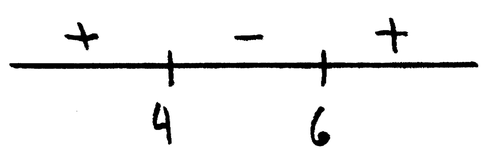
$x = \mathbb{R}$

68. $h = 0 + 160t - 16t^2 < 384$

$-16t^2 + 160t - 384 < 0$

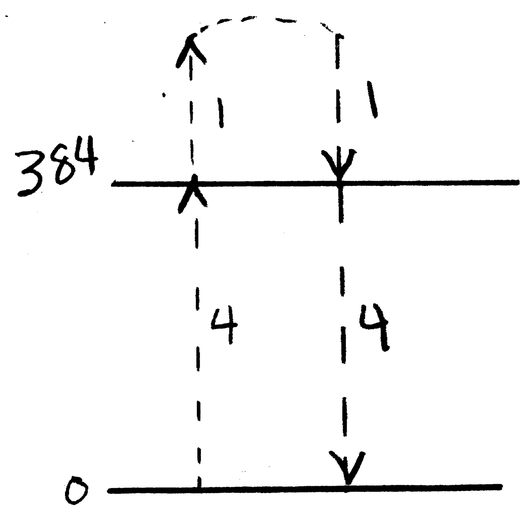
$t^2 - 10t + 24 > 0$

$(t-6)(t-4) > 0$



	$t-4$	$t-6$	
0	$-$	$-$	$+$
5	$+$	$-$	$-$
7	$+$	$+$	$+$

Note that the path is as follows.



So it is below 384 ft during the time intervals $[0, 4)$ and $(6, 10]$, a total of 8 seconds.

Section 3.4

$A = \{0, 1, 2, 3\}$
$B = \{-2, -1, 0, 1, 2\}$

5. YES.
6. NO: $f(1) = -2$ or 1
7. YES
8. NO: 2 is not used.

36. $f(x) = \sqrt{x+3} - 2$
   a. $f(-3) = \sqrt{-3+3} - 2 = 0 - 2 = -2$
   b. $f(1) = \sqrt{1+3} - 2 = 2 - 2 = 0$
   c. $f(x-3) = \sqrt{(x-3)+3} - 2 = \sqrt{x} - 2$
   d. $f(x+4) = \sqrt{(x+4)+3} - 2 = \sqrt{x+7} - 2$.

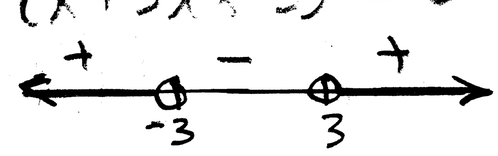
44. $f(x) = \begin{cases} x^2+1, & x \le 1 \\ 2x-3, & x > 1 \end{cases}$
   a. $f(-2) = (-2)^2 + 1 = 5$
   b. $f(1) = 1^2 + 1 = 2$
   c. $f(\frac{3}{2}) = 2(\frac{3}{2}) - 3 = 0$
   d. $f(0) = 0^2 + 1 = 1$

48. $2x^2 - 11x + 5 = 0$
   $(2x-1)(x-5) = 0$
   $x = \frac{1}{2}, 5$

52. $3 + \frac{2}{x-1} = 0$
   $\frac{2}{x-1} = -3$
   $-3(x-1) = 2$
   $-3x + 3 = 2$
   $-3x = -1$
   $x = \frac{1}{3}$

70. $f(x) = \frac{x-5}{\sqrt{x^2-9}}$
   Note that $x-5$ does not affect the domain — only what is under the sqrt.

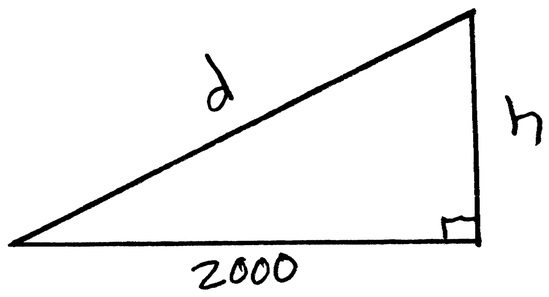
   $x^2 - 9 > 0$ (since in the denominator)
   $(x+3)(x-3) = 0$



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

	$x+3$	$x-3$	
-4	$-$	$-$	$+$
0	$+$	$-$	$-$
4	$+$	$+$	$+$

80.

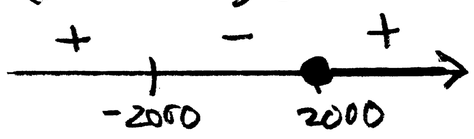


	$d-2000$	$d+2000$	
-3000	$-$	$-$	$+$
0	$-$	$+$	$-$
3000	$+$	$+$	$+$

$h = \sqrt{d^2 - 2000^2}$ (Pythagoras)

$d^2 - 2000^2 \geq 0$

$(d+2000)(d-2000) \geq 0$



But $d > 0$, so only the upper part.

$[2000, \infty)$

Intuitively, this makes sense because on the ground d is 2000, and increases as the balloon rises. Think about the reality of the problem! Just don't accept solutions blindly!

84. a. $C(x) = 11.75x + 112000$

b. $R(x) = 21.95x$

c. $P(x) = R(x) - C(x)$

$= 21.95x - (11.75x + 112000)$

$P(x) = 10.20x - 112000$