Math 103 Exam #1 Key (Fall 2011)

1a. $t - 4 = 6t - 4 \;\Rightarrow\; 5t = 0 \;\Rightarrow\; t = 0$

1b. $5x - 12 = 2x - 6 \;\Rightarrow\; 3x = 6 \;\Rightarrow\; x = 2$

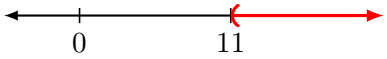
2. $2\mathcal{A} = h(b + B) \;\Rightarrow\; h = \dfrac{2\mathcal{A}}{b + B}$

3. Let x be the pre-tax amount. Then $x + 0.06x = 1945 \;\Rightarrow\; 1.06x = 1945 \;\Rightarrow\; x = 1834.91$. That is, the pre-tax amount is \$1834.91, so the amount of the tax is \$1945 − \$1834.91 = \$110.09.

4. Let x be the number of votes Old Man McCain got, in which case Barry got $x+192$ votes. Now, $x+(x+192) = 538$, so $2x = 346 \;\Rightarrow\; x = 173$. That is, McCain got 173 votes and Barry got 365 votes.

5. Let x equal the number of liters of 16% solution to be added. Then $0.16x + 0.68(22) = 0.55(x + 22)$, which leads to $0.16x + 14.96 = 0.55x + 12.10 \;\Rightarrow\; 0.39x = 2.86 \;\Rightarrow\; x = 7\frac{1}{3}$ L.

6a. $-3x < -33 \;\Rightarrow\; x > 11 \;\Rightarrow\; (11, \infty)$



6b. $-18 \le 3t \le 3 \;\Rightarrow\; -6 \le t \le 1 \;\Rightarrow\; [-6, 1]$

7a. $x \le 15$ and $x \ge -7 \;\Rightarrow\; -7 \le x \le 15 \;\Rightarrow\; [-7, 15]$. Graph included here, but not required:

7b. $2x < 24$ or $x > 16 \;\Rightarrow\; x < 12$ or $x > 16 \;\Rightarrow\; (-\infty, 12) \cup (16, \infty)$. Graph included here, but not required:

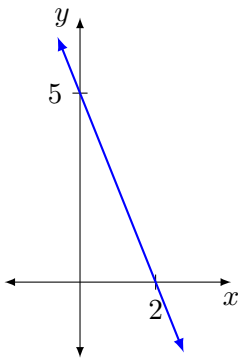
8. $8 - 3x = 16$ or $8 - 3x = -16 \;\Rightarrow\; 3x = -8$ or $3x = 24 \;\Rightarrow\; x = -\frac{8}{3}$ or $x = 8 \;\Rightarrow\; \{-\frac{8}{3}, 8\}$

9a. $3r - 1 > 8$ or $3r - 1 < -8 \;\Rightarrow\; r > 3$ or $r < -\frac{7}{3} \;\Rightarrow\; \left(-\infty, -\frac{7}{3}\right) \cup (3, \infty)$

9b. $|y + 5| \le 5 \;\Rightarrow\; -5 \le y + 5 \le 5 \;\Rightarrow\; -10 \le y \le 0 \;\Rightarrow\; [-10, 0]$

9c. No solution, since the absolute value of a number cannot ever be negative in value.

10. x-intercept is $(2, 0)$, and y-intercept is $(0, 5)$.



11. Midpoint is at $\left(\frac{2+7}{2}, \frac{-3-8}{2}\right) = \left(\frac{9}{2}, -\frac{11}{2}\right)$

12. One line has equation $y = 2x - 3$ and thus slope 2, and the other line has equation $y = -\frac{1}{2}x + \frac{3}{2}$ and thus slope $-\frac{1}{2}$. Since the slopes are negative reciprocals, the lines are perpendicular.

13. Slope of the line is $m = \dfrac{10-5}{-8-(-2)} = -\dfrac{5}{6}$, and so equation is $y - 5 = -\frac{5}{6}(x+2)$. Slope-intercept form: $y = -\frac{5}{6}x + \frac{10}{3}$; standard form: $5x + 6y = 20$.

14. The line $4x - y = 7$, which can be written $y = 4x - 7$, has slope 4. Thus, the line whose equation we must find has point $(-2, 5)$ and slope 4 also, which gives us the equation $y - 5 = 4(x+2)$ by the point-slope formula. Slope-intercept form: $y = 4x + 13$. Standard form: $4x - y = -13$.

15a. $4x^{-3} = \dfrac{4}{x^3}$

15b. $(k^5)^{-2}k^7 = k^{-10}k^7 = k^{-3} = \dfrac{1}{k^3}$