MATH 120 EXAM #3 KEY (SPRING 2008)

1 $D = \sqrt{(6-4)^2 + (-2-6)^2} = \sqrt{4+64}$
$= \sqrt{68} = 2\sqrt{17}$

2 $x^2 - 12x + y^2 + 10y + 25 = 0 \Rightarrow$
$(x^2 - 12x + 36) + (y^2 + 10y + 25) = 36 \Rightarrow$
$(x-6)^2 + (y+5)^2 = 6^2 \Rightarrow$ $\odot$ with center at $(6,-5)$ & radius 6.

3 Given line has eq. $y = \frac{5}{2}x - 5$, so slope of $\perp$ line is $-\frac{2}{5}$. Now...
$y - y_1 = m(x - x_1) \Rightarrow y - 8 = -\frac{2}{5}(x+2) \Rightarrow$
$y = -\frac{2}{5}x + \frac{36}{5}$

4a $y - 1 = \frac{2}{7}(x+4) \Rightarrow y = \frac{2}{7}x + \frac{15}{7}$

4b $x = 9$

5a $f(c-3) = 2(c-3) - 7 = 2c - 13$

5b $h(4) = -4^2 + 5(4) - 3 = 1$

6 $\text{Dom}\, \varphi = (-\infty, 1) \cup (1, \infty)$
$\text{Ran}\, \varphi = (-\infty, 0) \cup (0, \infty)$

7 $\text{Dom}\, r = \{x \mid x^2 - x - 2 \geq 0\} = \{x \mid (x-2)(x+1) \geq 0\}$
$= (-\infty, -1] \cup [2, \infty)$

8a $\text{Dom}\, f = \{x \mid x + 5 \geq 0\} = [-5, \infty)$
$\text{Dom}\, g = \{x \mid 12 - x \geq 0\} = (-\infty, 12]$

8b $(fg)(x) = \sqrt{x+5} \cdot \sqrt{12-x} = \sqrt{-x^2 + 7x + 60}$
$\text{Dom}(fg) = [-5, \infty) \cap (-\infty, 12] = [-5, 12]$

8c $(f/g)(x) = \frac{\sqrt{x+5}}{\sqrt{12-x}} = \sqrt{\frac{x+5}{12-x}}$
$\text{Dom}(f/g) = [-5, 12)$

9a $(f \circ g)(x) = f(\sqrt{x+8}) = \sqrt{\sqrt{x+8} - 10}$
$\text{Dom}\, f = [10, \infty)$ & $\text{Dom}\, g = [-8, \infty)$
$\text{Dom}(f \circ g) = \{x \mid x \in [-8, \infty) \text{ \& } \sqrt{x+8} \in [10, \infty)\}$
$= \{x \mid x \geq -8 \text{ \& } x \geq 92\}$
$= [92, \infty)$

9b $(h \circ g \circ f)(x) = h(g(\sqrt{x-10}))$
$= h(\sqrt{\sqrt{x-10} + 8}) = -\frac{8}{\sqrt{\sqrt{x-10} + 8}}$

10 $f(2) = |-4| + 22 = 26 = |4| + 22 = f(10) \Rightarrow$
Not 1-1.

11a $g(x) = y \Rightarrow y = \frac{4x}{x-3} \Rightarrow$
$xy - 3y = 4x \Rightarrow xy - 4x = 3y \Rightarrow$
$x = \frac{3y}{y-4} \Rightarrow g^{-1}(y) = \frac{3y}{y-4}$

11b $z(x) = y \Rightarrow y = 2 + \sqrt{x-5} \Rightarrow$
$y - 2 = \sqrt{x-5} \Rightarrow x - 5 = (y-2)^2 \Rightarrow$
$x = (y-2)^2 + 5 \Rightarrow$
$z^{-1}(y) = (y-2)^2 + 5, \quad y \geq 2$