Solutions

1. $y - y_1 = m(x - x_1)$

   $y - 1 = \frac{3}{4}(x - 12)$

   $y = \frac{3}{4}x - 9 + 1$

   $\boxed{y = \frac{3}{4}x - 8}$

2. $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad \frac{3-(-6)}{-2-1} = \frac{9}{-3} = \boxed{-3}$ OR $\frac{-6-3}{1-(-2)} = \frac{-9}{3} = \underline{-3}$

3. a) $(2x+5)(x-8) = 0$ OR Quadratic Formula $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

   $\boxed{x = -\frac{5}{2} \text{ or } x = 8}$

   b) $x = \frac{-(-1) \pm \sqrt{1-4(1)(-7)}}{2} = \boxed{\frac{1 \pm \sqrt{29}}{2} = x}$

4. Center: $(3, -15)$

   Radius: $\sqrt{25} = 5$

5. a) $2 \le \frac{x-2}{3} < 8$

   $6 \le x - 2 < 24$

   $8 \le x < 26$ $\quad \boxed{[8, 26]}$

   b) $|x - 5| > 6$

   $(x - 5) > 6$ or $(x - 5) < -6$

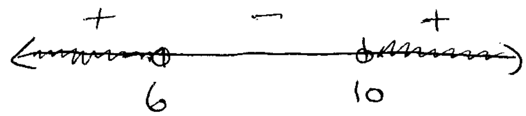
   $x > 11$ or $x < -1$

   $\boxed{(-\infty, -1) \cup (11, \infty)}$

c) $x^2 - 16x + 60 > 0$

$(x-10)(x-6) > 0$

$\begin{cases} (x-10)(x-6) = 0 \\ x = 10 \text{ or } x = 6 \end{cases}$



$\boxed{(-\infty, 6) \cup (10, \infty)}$

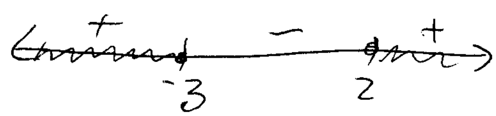
6) Find the domain

a) $f(x) = \sqrt{x^2 + x - 6}$

$x^2 + x - 6 \geq 0$

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

$\begin{cases} (x+3)(x-2) = 0 \\ x = -3 \text{ or } x = 2 \end{cases}$



$\boxed{\text{Domain: } (-\infty, -3] \cup [2, \infty)}$

b) $f(x) = \sqrt{\frac{1}{x+2}} = \frac{\sqrt{1}}{\sqrt{x+2}}$

$x + 2 > 0$ (cannot be equal to 0 since it is in the denominator)

$x > 2$

$\boxed{\text{Domain: } (2, \infty)}$

c) $f(x) = \frac{1}{x^2 - 9} = \frac{1}{(x+3)(x-3)}$

$\boxed{\text{All real numbers except } x \neq 3 \text{ and } x \neq -3}$

8) Yes, it is a function
Domain: [1, 8]
Range: [0, 15]

8) a) $f(x) = |x-3| + 2$
b) $f(x) = |-x| - 5$ or $|x| - 5$
c) $f(x) = -|x+4|$

9)
a) $(f \circ g)(x) = f[g(x)] = f[x^2] = x^2 + 1$
b) $(g \circ f)(x) = g[f(x)] = g[x+1] = (x+1)^2$ or $x^2 + 2x + 1$
c) $(f+g)(x) = x + 1 + x^2$
d) $(f-g)(x) = x + 1 - x^2$
e) $\left(\frac{f}{g}\right)(x) = \frac{x+1}{x^2}$
f) $(fg)(x) = (x+1)(x^2) = x^3 + x^2$

10) If $(f \circ g)(x) = x$ and $(g \circ f)(x) = x$ then f & g are inverses.

$(f \circ g)(x) = f[g(x)] = f(2x+3)$
$= \frac{(2x+3)-3}{2} = \frac{2x}{2} = x$

$(g \circ f)(x) = g[f(x)] = g\left[\frac{x-3}{2}\right] = 2\left(\frac{x-3}{\cancel{2}}\right) + 3$

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