Math 124 Quiz #1 Solutions

1. With rational functions, the domain will be values of x for which we do not get division by zero.

   Note: $x^2 - 4 = 0 \quad \Rightarrow \quad x^2 = 4 \quad \Rightarrow \quad x = \pm 2$

   Since the denominator is equal to zero only for $x = \pm 2$, the domain of $f(x)$ is all real numbers except $x = \pm 2$.
   You can also write this in the following ways:

   $x \neq \pm 2$ $\qquad$ $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$ $\qquad$ $\mathbb{R} \backslash \{-2, 2\}$

2. $\frac{g(3+h) - g(3)}{h} = \frac{2(3+h)^2 - 2(3)^2}{h} = \frac{2(9+6h+h^2)-18}{h}$ (Don't forget to FOIL $(3+h)^2$!)

   $= \frac{18+12h+2h^2-18}{h}$

   $= \frac{12h+2h^2}{h}$

   $= \frac{h(12+2h)}{h} = 12 + 2h$

3. Since $x = 1$ is in the domain of the 2nd piece of our piecewise-defined function, $f(1) = 1 + 4 = 5$.

4. (a) $\lim_{x \to 2} h(x) = 3$ since the values of $h(x)$ approach 3 as x approaches 2.

   (b) $\lim_{x \to 3} h(x)$ does not exist since the values of $h(x)$ are approaching different values from the right and the left of 3.

   (c) $\lim_{x \to 3^+} h(x) = 4$ since the values of $h(x)$ approach 4 as x approaches 3 from the right ($x > 3$).

   (d) $h(3) = 4$