Names: ______________________ ______________________ ______________________

Activity #5: Functions (Solutions) **College Algebra**

1. Evaluate the function
$$f(x) = 6x^3 + 3x + 5$$
at $x = 2$, $x = 0$, $x = -3$, and $x = 1/2$.

   Solution: We have
$$\begin{aligned} f(2) &= 6(2)^3 + 3(2) + 5 = \boxed{59} \\ f(0) &= 6(0)^3 + 3(0) + 5 = \boxed{5} \\ f(-3) &= 6(-3)^3 + 3(-3) + 5 = \boxed{-166} \\ f\left(\frac{1}{2}\right) &= 6\left(\frac{1}{2}\right)^3 + 3\left(\frac{1}{2}\right) + 5 = \boxed{29/4} \end{aligned}$$

2. Evaluate the function
$$f(x) = -4x^3 - 5x^2 - 3x - 1$$
at $x = -2$ and $x = -5$.

   Solution: We have
$$f(-2) = 17$$
and
$$f(-5) = 389$$

3. Evaluate the function
$$f(x) = \begin{cases} 4x - 3 & \text{if } x \geq 6 \\ \dfrac{1}{x^2 - 4} & \text{if } x < 6 \end{cases}$$
at $x = 8$, $x = 1$, and $x = -2$.

   Solution: This is a *piecewise defined* function, so remember that before we can evaluate f at a particular x we have to test x against the guards.

   First we'll find $f(8)$. Since $8 \geq 6$, we use the first branch of f. So
$$f(8) = 4 \cdot 8 - 3 = \boxed{29}.$$
Next we'll find $f(1)$. Since $1 < 6$, we use the second branch of f. So
$$f(1) = 4 \cdot 1 - 3 = \boxed{1}.$$
Finally, we'll find $f(-2)$. Since $-2 < 6$, we use the second branch of f. So
$$f(-2) = 4 \cdot (-2) - 3 = \boxed{-11}.$$

4. Let $f(x) = 6x + 2$ and $g(x) = x^2 - 3$. Compute the following.

   (a) $(f \circ g)(-3)$
   (b) $(g \circ f)(-3)$
   (c) $(f \circ g)(x)$

   Solution: Recall that $(f \circ g)(x) = f(g(x))$ for all x. So we have the following.

$$(f \circ g)(-3) = f(g(-3)) = f(6) = \boxed{38}$$

$$(g \circ f)(-3) = g(f(-3)) = g(-16) = \boxed{253}$$

$$(f \circ g)(x) = f(x^2 - 3) = \boxed{-16}$$

5. Let $f(x) = 5x + 4$ and

$$g(x) = \begin{cases} x^2 - 3 & \text{if } x \geq -1 \\ x + 5 & \text{if } x < -1. \end{cases}$$

   Compute the following.

   (a) $(f \circ g)(-1)$
   (b) $(g \circ f)(-1)$

   Solution: