Math 12
Vogler
Worksheet 3

NOTE: For the problems 1 and 2, you are constructing difference quotients, which is the slope of the secant line (a line that joins two points on a given curve $y = f(x)$) between two arbitrary points $(x, f(x))$ and $(x, f(x+h))$. These difference quotients are the foundation of the definition of the derivative, which you will learn in Calculus 1, and the algebraic manipulations done for these problems will help you compute derivatives in the future.

1.) For each given function, compute the difference quotient

$$\frac{f(x+h) - f(x)}{h}$$

a.) $f(x) = -2x + 9$ b.) $f(x) = 2x^2 - 3x + 1$ c.) $f(x) = \frac{3}{x}$ d.) $H(x) = 1 - 2x^2$

2.) For the function $g(x) = 2x^2 - x + 1$, compute the difference quotient

$$\frac{g(x) - g(a)}{x - a}$$

NOTE: This difference quotient, while might appear different, is equivalent to the difference quotient in problem 1. This leads to the alternate (but equivalent) form for the definition of the derivative. This form is used less, but can be useful when the 1st form becomes difficult to compute.

3.) In each case a pair of functions f and g are given. Find all real numbers x, for which $f(x) = g(x)$.

a.) $f(x) = 4x - 3$; $g(x) = 8 - x$ b.) $f(x) = 2x^2 - x$; $g(x) = 3$

4.) (OPTIONAL) Let $f(n) = n^2 - n + 2$. Find a value for k such that the following equation holds for all values of n.

$$f(n^2 + k) = f(n) \cdot f(n+1)$$