MAC 2311: Worksheet Sep. 13, 2016

1. For $f(x) = x^2 - 2x$, sketch the following secant lines and find their slopes:

(a) Between the points $(1, f(1))$ and $(2, f(2))$,

(b) Between the points $(1, f(1))$ and $(0, f(0))$,

2. Find the equation of the line tangent to the given graph at the indicated point:

(a) $f(x) = x^2 + x$ at $x_0 = 1$,

(b) $f(x) = \frac{2}{x+3}$ at $x_0 = 1$,

(c) $f(x) = \sqrt{2x + 3}$ at $x_0 = 2$.

3. If the height of a ball above the ground at time t is given by $h(t) = -32t^2 + 14t$, find the average velocity of the ball over the interval $[1, 3]$ and then find the instantaneous velocity of the ball at time $t_0 = 1$.

4. Use the definition to find the derivatives of the given functions:

a) $f(x) = 4x + 2$,

b) $f(x) = 2x^2 + 4x + 1$,

c) $f(x) = \frac{1}{x^2}$

5. Is the function $f(x) = |x|$ differentiable at $x_0 = 0$? Explain why or why not by showing that the limit defining $f'(0)$ does or does not exist.