Math 1300-001, Quiz 1 Name: _____

1. (The first problem is basically a repeat from last week's quiz.)

   (a) Write an expression for the slope $m(t)$ of the secant line through the points $(1, 1/3)$ and $(t, f(t))$ on the graph of $f(x) = \frac{x}{2+x}$.

   (b) Simplify the resulting expression to find the slope of the tangent line to the graph of $f(x)$ going through the point $(1, 1/3)$. In other words, find $\lim_{t \to 1} m(t)$.

   (c) Write an equation for the tangent line to the graph $f(x)$ through the point $(1, 1/3)$ (you know the slope of the line and a point on the line).

2. A height (in feet after t seconds) of a ball thrown straight into the air from 8 ft with an initial velocity of 8 ft/s is given by

$$h(t) = -16t^2 + 8t + 8.$$

(a) At what time does the ball hit the ground? (For what $t_0 > 0$ is $h(t_0) = 0$?) The answer is $t_0 = 1$.

(b) Find an expression for the average velocity $v(x)$ of the ball over the time interval $[x, t_0]$.

(c) Find the instantaneous velocity of the ball when it hits the ground, i.e. find $\lim_{x \to t_0} v(x)$.