Limits & Derivatives Worksheet

1. Find the limit (if it exists):

   (a) $\lim_{t \to 3} \frac{t^2+1}{t}$

   (b) $\lim_{x \to \frac{1}{2}} \frac{2x-1}{6x-3}$

   (c) $\lim_{x \to 0} \frac{\frac{1}{x-2}-1}{x}$

2. Describe the intervals on which the function is continuous:

   (a) $f(x) = \frac{x+1}{2x+2}$

   (b) $f(x) = \frac{1}{x^2+x-2}$

3. Find the slope of the tangent line at the given point:

   (a) $f(x) = (x-1)^2$ at $(-2, 9)$

4. Find the derivative using the definition of a derivative:

   (a) $f(x) = x^2 + 3$

   (b) $f(x) = 2x + 5$

5. Find the derivative:

(a) $f(x) = 3x^2 - x + \frac{1}{x}$

(b) $f(x) = x^{\frac{1}{2}} + x^3 - 6$

(c) $f(x) = \frac{2}{x^{\frac{5}{3}}}$

(d) $f(x) = (x+1)(x^3 - 2x - 1)$

(e) $f(x) = \sqrt{x}(x^2 - x)$

(f) $f(x) = \frac{4x+2}{x-1}$

(g) $f(x) = \frac{4x^2-3x}{x^{\frac{2}{3}}-x}$

6. The height h (feet) at time t (seconds) of a ball dropped off a building is given by: $h(t) = -16t^2 + 150$

   (a) Find the average velocity on the interval [1,2].

   (b) Find the instantaneous velocities when t=1 & t=2.

7. The revenue (in dollars) of selling x units of calculators is given by: $R(x) = 50x - 0.5x^2$

   (a) Find the additional revenue when sales increase from 9 to 10.

   (b) Find the marginal revenue when x=10.