§3.1: Differential Notation

1.] Let $f(x) = x^2 - x$. Assuming $y = f(x)$, use both the prime notation and the differential notation to evaluate $f'(x)$. Use the derivative to find $f'(2)$ and express your answer in both notations.

2.] A tennis ball is hit vertically upward so that its position function is given by $s(t) = -16t^2 + 96t + 4$ feet above the ground at t seconds. Find the velocity and acceleration functions. What are the initial position and velocity values?

3.] Consider the piecewise function $f(x)$ given below. Notice from the graph that $f(x)$ is continuous at $x = 1$. Show that $f(x)$ is not differentiable $x = 1$ and sketch $f'(x)$ on the graph below.

$$f(x) = \begin{cases} x^2 & \text{if } x \leq 1 \\ -x + 2 & \text{if } x > 1 \end{cases}$$