2. Part II

2.1. **Review II.** Instructions: The exam will cover sections 2.6, 3.1-3.3, 3.5

1. For each function, evaluate the derivative using the definition $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$.

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

b. $f(x) = \sqrt{2x - 3}$

c. $f(x) = 1/(2x - 3)$

2. From the picture:

a. Estimate the average rate of change over $[2, 3]$.

b. Estimate the derivative of the function at $t = 2$.

c. Find intervals over which the derivative is increasing and decreasing, respectively.

d. Where is the derivative zero?

3. Suppose that a stone is tossed in air with height $s(t) = -16t^2 + 64t$ feet at time t seconds. Find:

a. Velocity and acceleration at time t.

b. Initial height, velocity and acceleration.

c. Maximum height

d. Velocity when it hits the ground.

4. Find the equation of the tangent line for the following functions at the indicated point, and sketch:

a. $y = x^2 + 3$ at $x = 1$

b. $y = 3\sqrt{x}$ at $x = 4$

c. $y = 1/x$ at $x = 2$

5. Differentiate:

a. $y = 3 - 2x + 3x^3 - x^4 + \pi$.

b. $y = 3\sqrt{x} + \frac{4}{\sqrt{x}} - \sqrt{2009} + 2009^{2008}$

c. $y = \frac{4}{t^4} - \frac{3}{t^3} + \frac{2}{t}$

d. $y = (x^3 - 12x)(3x^2 + 2x)$

e. $y = \frac{\sqrt{x} + 1}{x^2 + 1}$

f. $y = \sqrt{2x^2 - 2x - 3}$

g. $y = x^2(2x^2 + 3x)^5$

h. $y = \left(\frac{2x+1}{3x+2}\right)^2$

i. $y = (3x^2 + 2)^{8/3}$ (find the second derivative and simplify)

j. $y = \frac{3x - 4}{2 + 5x}$ (find the second derivative and simplify)