_____Major Concepts _____

1. Derivatives: definition, concept, applications

2. Derivative computations: applying rules - sum,power, product, quotient, chain

3. Derivative of functions: polys, rational, radicals, trig, exponential, logarithmic

1. (a) Use the definition of the derivative to compute the derivative of $f(x) = \dfrac{1}{x}$.

(b) Use the definition of the derivative to compute the derivative of $f(x) = 3x^2$.

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2. Find the slope of the tangent line to the curve $y = 3x^2 + 2x + 1$ at $x = 5$.

3. (a) Express the volume V of a cube as a function of its side length x.

   (b) Take the derivative of your equation. This is the rate of change of the volume of a cube as a function of x.

   (c) Compute $V'(1)$, $V'(2)$, $V'(5)$ and $V'(10)$.

   (d) Which has the greater affect on volume, lengthening the side length of a *small* cube by 1 or a large cube by by 1?

4. Compute the derivatives of the following.

   (a) $3\sin(4t)$

   (b) e^{7t}

   (c) $\dfrac{\sqrt[3]{x} - \ln(x)}{\sqrt{x^2 + 1}}$

5. Suppose that $f(x) = \dfrac{6x + 10}{x}$. Evaluate $f'(x)$ and $f'(3)$.

6. Suppose that $f(x) = 2x^{-4} + 3x^{-2}$. Evaluate $f'(x)$ and $f'(2)$.

7. Suppose that $f(x) = \tan \dfrac{1}{x} + 3 \cos (x^{-2})$. Evaluate $f'(x)$.

8. Suppose that $f(x) = \sqrt{x} \sin (x)$. Evaluate $f'(x)$ and $f'(\pi)$.

9. Suppose that $f(x) = \dfrac{6x + \cos x}{x + \sin x}$. Evaluate $f'(x)$ and $f'(3)$.

(a) Find the slope of the tangent line to $f(x)$ at $x = 2$.

(b) Find the instantaneous rate of change of $f(x)$ at $x = 2$.

(c) Find the equation of the tangent line to $f(x)$ at $x = 2$.

10. A bungee jumper's height in feet above the river is given by $f(t) = 876e^{-.17}\cos(-.05x)$ where t is the number of seconds after jumping. Compute the velocity of the jumper at the following times: $t = 1, t = 19, t = 60$.