Problem Set 2 (Total Points: 100), Due July 18th

Review Questions

Find the following derivates (5 points each):

1. $(3x^2 \ln(x))'$
2. $(\sqrt{x^2 + 2x + 1})'$

Problem (3)**.** (40 points): The derivate of acceleration with respect to time is called "jerk".

(a) The n^{th} derivate of distance with respect to time is jerk. What is n?

(b) Write a paragraph explaining why jerk is called "jerk." Use the example of riding in a car and you suddenly step on the gas or brakes. Having sketches of graphs in your answer will increase your chance of getting full points. I'm not placing a specific length on this paragraph but it needs to be long enough to fully explain your ideas.

Using Derivatives Questions

For the following functions find the equation of the tangent line at the given x-value. That is find the linear approximation of the function at the given point. Sketch a graph of the function and the tangent line (feel free to use Desmos) (10 points each):

4. $f(x) = \frac{1}{3}x^3 - 5$ at $x = 3$.
5. $g(x) = \sin(x)$ at $x = \pi$.
6. $h(x) = \dfrac{x}{x-1}$ at $x = 2$.

Problem (7)**.** (20 points): Suppose a rock is dropped in a pool of water. A circular water ripple is created expanding at a rate of 0.3 meters per second.

(a) Find how fast the circumference of the circle is growing (in meters per second)

(b) Find how fast the area of the circle is growing (in meters squared per second).

Problem (8)**.** (Bonus, 15 points): Consider the curve given by the equation $x^2 + y^3 = 1$. Find the equations for linear approximations of the curve at $(0, 1)$ and $(1, 0)$.