Math 34A - Derivatives & Word Problems

Recall (from last time):

Limit Definition of Derivatives

Interpretations of Derivatives

Example. Suppose a ball is thrown up into the air and $h(t)$ is a function that represents the height of the ball after t second. What does the following mean?

1. $h(0)$

2. $h(3)$

3. $h'(0)$

4. $h'(2)$

5. $h''(3)$

Differentiation Rules

1. Power rule: If n is any real number, then

2. "Constant rule": If c is any constant, then

3. "Sum rule":

4. "Mutiplication-by-a-constant rule": If c is any constant, then

Examples. Find the derivative of the following functions.

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

2. $f(x) = \sqrt{x} + 4x^{-1} - 29$

3. $f(x) = \pi^3 + 4$

4. $f(x) = x^e - 1$

Tangent Line Approximation

Example. Let $f(x) = 2x^2 + \sqrt{x} + 10$. Find the equation of the tangent line at $x = 1$. Use it to approximate $f(1.5)$.

(11.0.51) The height of water in a marina is shown on a vertical ruler fixed to a pier. The height t hours after noon is $h(t)$ inches. If $h(2) = 200$ and $h'(2) = -30$ what approximately is the height at $2 : 10$pm?

Word problems from Chapter 11

1. Car problem: (11.0.17) Car A starts in Sacramento at 11am. It travels along a 400 mile route to Los Angeles at 60mph. Car B starts from Los Angeles at noon and travels to Sacramento along the same route at 75mph. The route goes past Fresno which is 150 miles along the route from Los Angeles. How far from Fresno are the cars when they meet?

2. Mixing problem: (11.0.14) What amounts of 75% pure silver and 80% pure silver should be mixed to obtain 14 grams of 78% pure silver?

3. Express in terms of problem: (11.0.19) Express the length of the perimeter of a circle in terms of the area of the cirlce.

4. System of equation problem: (11.0.22) A tin can has a circular base has volume of 75π cm^3 and the surface area of the vertical (curved) side is 30π cm^2. What are the dimensions of the can?