

Presentation Examples

Round 2

University Calculus I

Section 1

Fall 2010

Each Round 2 example will be presented by a team of two students. Dates shown in parentheses are *projected dates* and are tentative. It's possible, even likely, that an example could be presented *after* the date specified, but an example will not occur before this date without consent of the presenters. Presentations will be graded using criteria including pace, clarity, boardwork, verbal commentary, completion, and correctness. The expectations will be higher for the second presentation! Both students must take an active role in presenting. **This schedule is also posted on our web page and will be updated as necessary.**

3.5 Example #1 (Ajax Hayes & Caleb Brown–November 10). Calculate the derivative of the arccosine function \cos^{-1} . (Use implicit differentiation.) Express your formula in terms of the original input variable.

3.6 Example #1 (Erin Thompson–November 12). Find the derivative of $f(x) = \log_{10} \left(\frac{x}{(x-1)^3} \right)$ in two different ways: First by differentiating the function as given, and second by simplifying first using the laws of logarithms.

3.6 Example #2 (David Newcomb & Victoria Renodin–November 12). Differentiate $y = x^{1/x}$ using logarithmic differentiation.

3.10 Example #1 (Kyle Hartwick–November 12). Let $g(x) = \sqrt[3]{1+x}$.

1. Find the linearization of g at $a = 0$.
2. Use the linearization to approximate the numbers $\sqrt[3]{0.95}$ and $\sqrt[3]{1.1}$.

3.10 Example #2 (Chelsea St. George & Matt Colucci–November 15). Approximate the value of $1/1002$ using a linear approximation.

3.9 Example #1 (Emily Simson & Mary Calhoun–November 16). Suppose x and y are differentiable functions of t , and $y = \sqrt{x}$.

1. Find $\frac{dy}{dt}$ when $x = 4$, given that $\frac{dx}{dt} = 3$.
2. Find $\frac{dx}{dt}$ when $x = 25$, given that $\frac{dy}{dt} = 2$.

3.9 Example #2 (Kevin Marsh–November 16). Convert the following verbal statements into mathematical models.

1. The velocity of a car is 50 mph after the car has traveled for 1 hour.
2. Water is being pumped into a swimming pool at a rate of 10 cubic feet per minute.
3. A gear is revolving at the rate of 25 revolutions per minute. (Note that 1 revolution = 2π radians.)

3.9 Example #3 (Jeongwoo Kwak–November 17). Demonstrate a solution to Exercise 16 on p. 245. Clearly show all the problem-solving steps involved. A spotlight on the ground shines on a wall 12 m away. If a man 2 m tall walks from the spotlight toward the building at a speed of 1.6 m/s, how fast is the length of his shadow on the building decreasing when he is 4 m from the building?

3.9 Example #4 (Sean Larson & Tyler Handy–November 17). Demonstrate a solution to Exercise 18 on p. 245. Clearly show all the problem-solving steps involved. A baseball diamond is a square with side 90 ft. A batter hits the ball and runs toward first base with a speed of 24 ft/s.

- (a) At what rate is his distance from second base decreasing when he is halfway to first base?
- (b) At what rate is his distance from third base increasing at the same moment?

4.1 Example #1 (Katie Nolan & Leah Kleiman–November 19). Find the critical numbers of $f(x) = 2x^4 - 4x^2$ in the interval $[-2, 3]$.

4.1 Example #2 (Kelsey Williams & Zach Forys–November 29). Find the absolute extrema of $f(x) = 2x - 3x^{2/3}$ on the interval $[-1, 3]$. Before starting, explain how you know absolute extrema will exist.

4.3 Example #1 (Mitch Newport & Zen Maciejewski–December 6). Find the intervals on which the function $f(x) = 2x^3 + 3x^2 - 12x + 333$ is increasing and the intervals on which it is decreasing. Show all the factoring and testing involved.

4.3 Example #2 (Markus Deas & Dino Salkic–December 6). Let $f(x) = \ln|x^3 - \frac{3}{2}x^2|$.

1. Find the open intervals on which f is increasing and those on which it is decreasing.
2. Find the local minimum and local maximum values of f .

4.3 Example #3 (Anna Maynard & Alex Summerton–December 7). Sketch the graph of a function satisfying all the conditions given in Exercise 28 on p. 296. Be sure to explain your reasoning and the steps you use in constructing the graph and to verify that the resulting graph satisfies the required conditions.

4.4 Example #1 (Morgen Randall & Christian Conable–December 7).

1. Find $\lim_{x \rightarrow 0} \frac{e^{2x} - 1}{x}$. Does L'Hospital's Rule apply?
2. Find $\lim_{x \rightarrow \infty} \frac{e^{2x} - 1}{x}$. Does L'Hospital's Rule apply?

4.4 Example #2 (Jaeho Lee & Jordan Marsh–December 7). Calculate

$$\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}.$$

4.4 Example #3 (Michelle Olney & Heidi Gunio–December 8). Find

$$\lim_{x \rightarrow -\infty} xe^x.$$