

Calculus I (Math 231) Exam 2

Date: November 5, 2007

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Justify answers and show all work for full credit.

NAME: _____

Problem 1. *Compute the derivative of the following functions. Do not simplify. Show all work!*

(a) $f(x) = \frac{3x - 2}{\sqrt{2x + 1}}$

(b) $f(x) = \cos^2(x^3)$

(d) $f(x) = \sqrt[3]{x} e^{-(x^2+2)}$

Problem 2. *Suppose x and y satisfy $x + x^2y^2 + \sin(3y) = 2$.*

Find $\frac{dy}{dx}$ at the point $(1, 0)$.

Problem 3. Let $f(x) = \sqrt{3 + 5x}$.

(a) Use the definition of the derivative to find $f'(1)$.

(b) Use any method to find $f''(1)$.

Problem 4. A bullet is fired up from the ground with initial velocity of 3200 ft/sec.

(a) Find the maximum height of the bullet.

(b) Find the velocity of the bullet when it returns to the ground.

Problem 5. A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/sec, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

Problem 6. Let $f(x) = x^3 - 3x^2 + 1$.

(a) Find the critical points.

(b) Find intervals where $f(x)$ is increasing or decreasing.

(c) Identify all relative extrema using the First Derivative Test.

(d) Identify the absolute max and min of $f(x)$ for $1 \leq x \leq 3$.