

Midterm #1, Math 16a, Fall 2010

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Thursday, September 30, 2010

Your Name:

Your TA's Name:

Your Section Number:

Scoring. There are seven problems, each worth 10 points for a maximum possible score of 70 points.

IMPORTANT: Do all work on the exam, use the back if you need more space. **No calculators, notes, or books.**

Score

1.

2.

3.

4.

5.

6.

7.

Total

1. Find

$$\lim_{x \rightarrow \infty} \frac{x^2 - 4x + 4}{2x^2 - 9}$$

2. Use the definition of the derivative as a limit to show that $f(x) = x^{1/3}$ is not differentiable at $x = 0$.

3. Use the definition of the derivative as a limit to show that $f(x) = x^{1/3}$ is differentiable at $x = 2$.

HINT: $(p - q) = (p^{1/3} - q^{1/3})(p^{2/3} + p^{1/3}q^{1/3} + q^{2/3})$

4. Find the derivative of

$$y = x + 1 + \sqrt{x + 1}$$

5. Find the equation of the line tangent to the curve

$$y = \frac{1}{x^3 - x}$$

at $x = 2$.

6. Using the derivative, find an approximate value of $126^{1/3}$.

7. Draw examples of functions with domain $(0, 1)$ of the following types. Explain clearly why your examples have the required properties.
- (a) $y = f(x)$ is increasing and not continuous
 - (b) $y = f(x)$ is increasing, continuous, and not differentiable at some c in $(0, 1)$
 - (c) $y = f(x)$ has exactly two points of inflection and exactly one relative extreme point