

Final Exam, Math 16a, Fall 2010

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Wednesday, December 15, 2010

Your Name:

Your TA's Name:

Your Section Number:

Scoring. There are twelve problems. Each problem is worth ten points, for a maximum possible score of 120 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.

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11.

12.

Total

1. Find the point on the graph of $y = x^2$ where the curve has slope -6.

2. Evaluate the following limit.

$$\lim_{x \rightarrow 0} \frac{\ln(2+x) - \ln(2)}{x}$$

3. Differentiate the following functions.

(a) $f(x) = x^x$

(b) $g(x) = (2\ln(x + 2) + 1)^{200}$

4. Find the equation of the line tangent to the curve $y^2 = x^3 + x + 6$ at the point $(2, 4)$.

5. You are viewing the launch of the space shuttle from a safe distance of 3 miles from the launch pad. Find the vertical speed of the shuttle at the instant when the distance between you and the shuttle is 5 miles and that distance is increasing at 5,000 miles/hour.

6. Use a linear approximation to give an approximate value for $1001^{\frac{1}{3}}$.

7. Evaluate the following indefinite integrals.

(a) $\int x e^{x^2} dx$

(b) $\int \frac{1}{x} dx$ (Note, $\frac{1}{x}$ has domain the set x with $x \neq 0$.)

8. Sketch the graph of $y = x^3 - 2x^2 + x$. Clearly indicate all x -intercepts, relative and absolute extreme points, and points of inflection.

9. Sketch the graph of $y = xe^{-x^2}$. Clearly indicate all x -intercepts, relative and absolute extreme points, and points of inflection.

10. Calculate the volume of the solid of revolution obtained by rotating the region under graph $y = \frac{1}{\sqrt{x}}$ between 1 and 2 about the x -axis.

11. Determine all functions $y = f(x)$ such that $y' = -.5y$ and $f(0) = 1$.

12. An investor initially invests \$10,000 in a speculative venture. Suppose that the investment earns 20% interest compounded continuously for the first 5 years and then 6% interest compounded continuously for 5 years thereafter. How much is the investment worth after 10 years?