

Review for Final Exam

Exam date: 25 Jul '12

Instructions. Here is a list of *some* of the things that you should know for the exam. Some are example problems that you should be able to work out. Others are terms or ideas that you should know. I won't ask you to write down any definitions or theorems word-for-word, but you should know what they say, what they mean, and how to use them.

1. Find the limits.

- $\lim_{h \rightarrow 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$
- $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x^2 - x - 6}$
- $\lim_{x \rightarrow -\infty} \frac{3x^3 - 4x^4 + 5x}{2x + 3x^2 + 9x^4}$
- $\lim_{h \rightarrow 1} \frac{1 - h}{\ln(h)}$

2. Find dy/dx . Simplify when necessary.

- $y = 12x^2 + 5x - \ln(x)$
- $y = e^{\ln(x^2+1)}$
- $y = \frac{x}{x^2+1}$
- $xy + y^2 = x^2 - \ln(y)$
- $y = x^2 e^y$

3. Use the limit definition of derivative to find $\frac{d}{dx}[\sqrt{x}]$.

4. What is the intuitive definition of continuous? What is the limit definition of continuous? Determine whether this function is continuous at $x = 0$.

$$f(x) = \begin{cases} x^3 - 4x^2 + 5x, & x < 0 \\ \sqrt{x}, & x \geq 0 \end{cases}$$

5. Find an equation for the tangent line to the graph $x^2 - y^2 = 25$ at the point $(13, -12)$.

6. A clown is blowing up a spherical balloon. The volume is increasing at a rate of $0.5 \text{ cm}^3/\text{sec}$ when the volume of the balloon is $36\pi \text{ cm}^3$. At what rate is the radius of the balloon increasing?

7. Find the integrals.

- $\int_1^2 x^2 dx$

- $\int \frac{3x}{2x^2 + 1} dx$

- $\int_0^\pi e^t dt$

- $\int_1^e \frac{1}{x} - \frac{\ln(x)}{x} dx$

- $\int x^9 e^{x^{10}} dx$

- $\int 4x^2 \sqrt{x^3 + 5} dx$

- $\int \frac{1}{x \ln x} dx$

- $\int_6^7 \frac{(t-5)}{t-5} dt$

8. What is the geometric interpretation of a definite integral? Use this geometric interpretation to evaluate the following definite integrals.

- $\int_0^3 \sqrt{9 - x^2} dx$

- $\int_{-2}^0 (-3x) dx$

9. Given a demand (price) function $p = \frac{1000}{x}$, find the average price (in dollars) over the interval $[400, 600]$.

10. A company produces x HDTVs per month. The monthly marginal profit from producing x TVs is given by $P'(x) = 300 - 0.2x$. If monthly production is increased from 1,400 to 1,500 TVs, find the increase in profit that will be generated.