

Exam 2

Name: _____

Math 125.01
March 29, 2007

Question	Points Earned	Points Possible
1		16
2		12
3		4
4		5
5		6
6		8
7		10
8		6
9		6
10		12
11		4
12		6
13		6
Total		100

1. Find $f'(x)$ for the following functions.

(a) $f(x) = (x + 1)^2(x^2 + 2x)$

(b) $f(x) = \frac{3x}{\sqrt{x} - 1}$

(c) $f(x) = \frac{1}{\sin^2 x} - \frac{2}{\sin x}$

(d) $f(x) = 2x \cos x$

2. Find $\frac{dy}{dx}$ for the following functions.

(a) $y = 5 \ln(x^3 + 3x^2 - 2)$

(b) $y = \ln(\sin^2 x)$

(c) $y = 2(\ln x)^3$

3. Find $f'(x)$ if $f(x) = e^{\tan(x)} + \sec^2(e^x + x^3)$.
4. Calculate $f''(x)$ if $f(x) = \ln(x^2 + x)$.
5. Prove that if $f(x) = \csc x$, then $f'(x) = -\csc x \cot x$.
(You may use known derivatives of $\sin x$ and $\cos x$.)

6. Find the derivatives of each of the following. (Recall $\frac{d}{dx}(\tan^{-1} x) = \frac{1}{1+x^2}$.)

(a) $y = \ln(\tan^{-1} x)$

(b) $y = \tan^{-1}(e^{-t})$

7. A dynamite blast blows a heavy rock straight up with a launch velocity of 160 ft/sec. It reaches a height of $s = 160t - 16t^2$ ft after t sec.

(a) How high does the rock go?

(b) What are the velocity and speed of the rock when it is 256 ft above the ground and on the way down?

(c) What is the acceleration of the rock at any time t during its flight (after the blast)?

(d) When does the rock hit the ground again?

8. Consider the function $f(x) = \sqrt{1+x} + \sin x - 0.5$.

(a) Find the linearization of f at $x = 0$.

(b) Use the linearization from part (a) to approximate $f(0.1)$.

9. The power P of an electric circuit is related to the circuit's resistance R and current I by the equation $P = RI^2$.

(a) How is dP/dt , dR/dt , and dI/dt related if none of P , R , and I are constant?

(b) How is dR/dt related to dI/dt if P is constant and I is not constant?

10. Suppose that the functions f and g and their derivatives with respect to x have the following values at $x = 1$ and $x = 3$.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	-4	3	$-3/2$	6
3	4	5	2	1

Find the derivatives below with respect to x at the given values. (Simplified answers are expected.)

(a) $2f(x) - 3g(x)$, $x = 1$

(b) $e^{f(x)} \cdot \ln(g(x))$, $x = 3$

(c) $f(g(x))$, $x = 1$

(d) $(x^2 + f(x))^3$, $x = 3$

11. If $y^2 = \frac{x}{x+1}$, then find $\frac{dy}{dx}$.

12. Find the equation of the tangent line to the curve $x^2 + xy + y^2 - 5x = 2$ at the point $(1, 2)$.

13. The radius of a circle is changing at the rate of $-2/\pi$ m/sec. At what rate is the circle's area changing when $r = 10$ m?