

This test consists of 4 pages, all different and none intentionally left blank.
Take a minute *right now* to ensure that you have all 4 of these pages.
In order to receive credit for your answers, you must show your work!!

1. (1 point each) First, let's see if you know the basic differentiation building blocks. Fill in the following table:

f	f'	f	f'
x^n		e^x	
$\ln(x)$		$\sin(x)$	
$\cos(x)$		$\tan(x)$	
$\cot(x)$		$\sec(x)$	
$\csc(x)$		$\arcsin(x)$	
$\arctan(x)$		$\operatorname{arcsec}(x)$	

2. (4 points each) Suppose $h(x) = f(x)g(x)$ and that $F(x) = f(g(x))$. If $f(2) = 3$, $g(2) = 5$, $f'(2) = -2$, $g'(2) = 4$ and $f'(5) = 11$, find
- (a) $h'(2)$
- (b) $F'(2)$

3. (10 points) Find an equation of the tangent to $y = e^x$ that is parallel to the line $x - 4y = 1$.

4. (10 points) Suppose $f(3) = -1$ and $f'(3) = 5$. Find an equation for the tangent line to the graph of $f(x)$ at $x = 3$.

5. (10 points) Find the linear and quadratic approximation to

$$f(x) = \frac{1}{(x+1)^2}$$

near 1.

6. (10 points) The graph of $f(x) = x^3 - 4x + 1$ shows a zero between $x = 0$ and $x = 1$. Starting with $x = 0$, perform two steps of Newton's method for approximating this root of f . Remember that you must show your calculations even if you do them on your calculator.

7. (5 points each) Evaluate the following limits: Be sure to show your algebraic simplifications and your applications of the theorems you used to obtain your answer. Calculator approximations will not suffice.

(a)
$$\lim_{x \rightarrow \infty} \frac{\ln(\ln(x))}{\ln(x)}$$

(b)
$$\lim_{x \rightarrow 0} (1 + .05x)^{(1/x)}$$

(c)
$$\lim_{x \rightarrow -\infty} \tan^{-1}(x^4)$$

8. (5 points each) Find the derivative of each of the following functions:

(a) $f(x) = \sin^{-1}(\ln(x))$

(b) $f(x) = 10^{\tan(x)}$

(c) $f(x) = (\cos(x))^{\sin(x)}$

9. (10 points) Find a parabola $y = ax^2 + bx + c$ that passes through the point $(1, 4)$ and whose tangent lines at $x = -1$ and at $x = 5$ have slopes 6 and -2 respectively.