

MATH 1311 FALL 2009

CALCULUS I



FIRST MIDTERM EXAM

WEDNESDAY, SEPTEMBER 30

YOUR NAME (PLEASE PRINT):

Instructions: This is a closed book, closed notes exam. **Use of calculators is not permitted.** You must justify all of your answers to receive credit. Notation is important, and points will be deducted for incorrect use. Please do all of your work on the paper provided.

The Honor Code requires that you neither give nor receive any aid on this exam.

Please indicate that you have read and understood these guidelines by signing your name in the space provided:

Pledged: _____

Do not write below this line

Problem	1	2	3	4	5	6	7	8	9
Points	20	8	10	20	12	12	5	8	5
Score									

Total: _____

1. Find the limit or show that it does not exist.

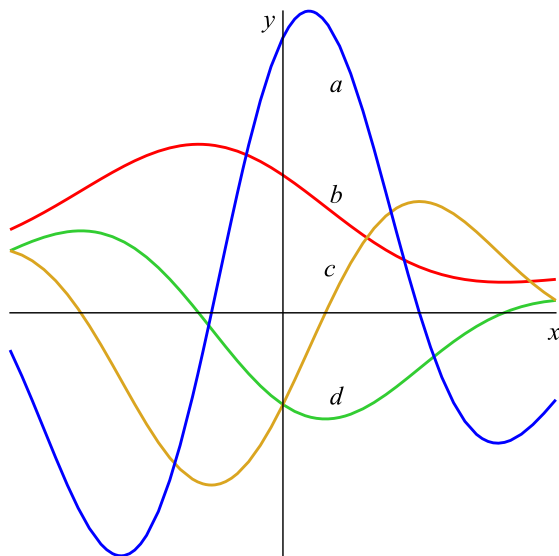
a. $\lim_{x \rightarrow -4} \frac{x^2 + 3x - 4}{x^2 + 5x + 4}$

b. $\lim_{w \rightarrow 7} \frac{\sqrt{w+2} - 3}{w - 7}$

c. $\lim_{x \rightarrow \infty} \frac{\sqrt{9x^6 - x}}{1 + x^3}$

d. $\lim_{t \rightarrow 1} \left(\frac{1}{t^2 - t} - \frac{1}{t - 1} \right)$

2. The figure below shows the graphs of f , f' , f'' and f''' . Identify each curve. You do not have to justify your answers.



f	f'	f''	f'''

3. The tangent line to the graph of $y = f(x)$ at $x = 2$ is $x + 2y = 3$. Use this to find an equation for the tangent line to $y = [f(x)]^2$ at $x = 2$. Write your answer in the form $ax + by = c$.

4. Differentiate.

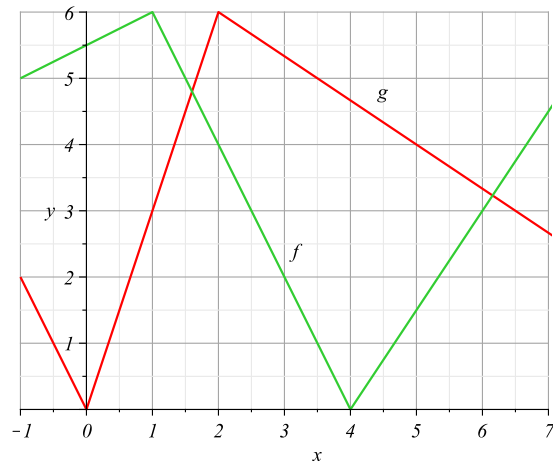
a. $y = (x^5 - 3x^3 + 2x - 7) \sin^2 3x$

b. $G(y) = \tan^{-1} \sqrt{y}$

c. $f(t) = \cos \left(\frac{t+3}{t-5} \right)$

d. $h(z) = \ln \left(1 + e^{z^3} \right)$

5. If f and g are the functions whose graphs are shown below, let $A(x) = f(g(x))$, $B(x) = g(f(x))$ and $C(x) = g(g(x))$.



a. Find $A'(1)$.

b. Find $B'(2)$.

c. Find $C'(5)$.

6.

a. Write down the limit definition of $f'(x)$.

b. *Use the limit definition* to find the derivative of $f(x) = 2x^2 + 3x - 5$.

7. Show that the function

$$r(x) = \begin{cases} \frac{2 - |x|}{2 + x} & \text{if } x \neq -2 \\ 1 & \text{if } x = -2 \end{cases}$$

is continuous at $x = -2$.

8. Find an equation for the tangent line to the curve $3x^3 + x^2y = 3 + xy^3$ at the point $(1, 1)$. Express your answer in the form $ax + by = c$.

9. For what values of r does the function $y = e^{rx}$ satisfy the equation $y'' + 5y' - 6y = 0$?

