

Math 1710 Section 3  
February 13, 2008  
Midterm #1

Name:

You must show **all** your work to receive full credit.

1. Let  $f(x) = x^2 - \frac{1}{x}$ . Find the average rate of change of  $f$  over the interval  $[1, 3]$ .

For problems 2 and 3 find a positive number  $\delta$  such that if  $|x - a| < \delta$ , then  $|f(x) - L| < \varepsilon$ .

2.  $f(x) = \sqrt{3x + 1}$ ,  $a = 5$ ,  $L = 4$ ,  $\varepsilon = 1$

3.  $f(x) = x + 6$ ,  $a = -2$ ,  $L = 8$ ,  $\varepsilon = \frac{1}{2}$

In problems 4-7 evaluate the given limits.

4.  $\lim_{x \rightarrow -\infty} \frac{2x^6 + 3x^3 + x^2 - 10}{-x^3 + 5x^2 - x + 1}$

5.  $\lim_{x \rightarrow \infty} \frac{6x^2 + x - 5}{-2x^2 + 500x}$

6.  $\lim_{x \rightarrow 1^-} \frac{x^2 - x}{(x+5)(x-1)^2}$

7.  $\lim_{x \rightarrow 0} \frac{\sin 10x - x}{x \cos x}$

8. Find the derivative of  $f(x) = \sqrt{\sin x}$ .

9. Find the second derivative of  $g(x) = \sin x \cos x$ .
10. Using only what you know about the derivatives of  $\sin x$  and  $\cos x$  and the only trigonometric identity **that I said you would have to know**, find the derivative of  $h(x) = \tan x$ .
11. **From definition** find the derivative of  $f(x) = x^2$ .
12. Using implicit differentiation, find  $\frac{dy}{dx}$  if  $3xy + y^2 = 4x^2$ .