

**EXAM 2**  
**MAT 221**

Name \_\_\_\_\_

October 14, 2011

- ❖ You have 50 minutes to complete the exam.
- ❖ Partial credit will be given so you must **SHOW ALL OF YOUR WORK**. Put all of your work and answers in the space provided. Scratch paper is not allowed.
- ❖ Place your books, notebooks, etc. on the floor. The only items on your desk should be this exam and pencil/eraser/pen. Calculators are not allowed.

Problem	Points	Points per part	Points Earned
True-False	10	2	
1	10		
2	4	2	
3	8	4	
4	40	8	
5	7		
6	9		
7	12		
<b>TOTAL</b>	<b>100</b>		

Please circle your section:

8:00  
Friske

1:30  
Friske

### I. True – False

- T F a. If  $f(x) = \frac{4x+1}{x^2+1}$ , then  $f(x)$  is differentiable for all real numbers  $x$ .
- T F b. If  $\lim_{x \rightarrow c} f(x) = f(c)$ , then  $f$  is differentiable at  $c$ .
- T F c. If the velocity of an object is constant, then so is its acceleration.
- T F d.  $\frac{d}{dx} |x| = -1$  for all  $x < 0$ .
- T F e. For any real number  $x$ ,  $\frac{d}{dx} \arctan x + \frac{d}{dx} \operatorname{arccot} x = 0$ .

### II. Concepts

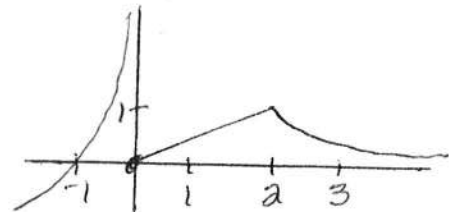
1. Write down the defining expression for the derivative  $f'(x)$  as a limit of slopes of secant lines. Draw and label the corresponding diagram.

2. Name two ways Newton's Method can fail.

3. Answer the following questions for the function  $f(x)$  graphed below.

(a) At which values of  $x$  is  $f$  not differentiable? \_\_\_\_\_

(b)  $f'(1) =$  \_\_\_\_\_



### III. Differentiation Techniques

4. Find the derivative. Do NOT simplify your answer.

(a)  $y = \sqrt{x} + 3e^x$

(b)  $y = \cos^2(5x + 1)$

(c)  $y = \frac{x+2}{1-x^2}$

(d)  $x + y = \cos y$  Find the value of  $y'$  at the point  $(1, 0)$ .

(e)  $f(x) = \operatorname{arccot}(\ln x)$

#### IV. Applications

5. Find an equation of the tangent line to the graph of  $f(x) = 4x^3 + 2x - 1$  at the point  $(1, 5)$ .

6. The height of a baseball  $t$  seconds after leaving the bat of Prince Fielder is given by  $y(t) = -16t^2 + 96t + 3$  ft. For this position function find

(a) velocity at  $t = 1$ . \_\_\_\_\_

(b) acceleration at  $t = 3$ . \_\_\_\_\_

(c) time  $t$  when the tangent line to  $y(t)$  is horizontal. \_\_\_\_\_

7. The side of length  $x$  in the right triangle below is increasing at a rate of 4 ft/sec while the side of length 5 remains constant. At what rate is  $y$  changing when  $x = 3$ ?

