

# V1

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Last Name: \_\_\_\_\_

First Name: \_\_\_\_\_

ID: \_\_\_\_\_ Section: \_\_\_\_\_

Math 150A Midterm #2. October 17, 2005

**Attention!** Please, note that this is the closed book test. You are not allowed to use graphing calculator. Simple calculators are allowed. Please, show all important steps in you solution but do not make your solution excessively long.

1. Use the definition to verify if the given function is continuous at a specified point

a) (5pt) the function

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

at  $x = 1$ ;

b) (10pt) the function

$$g(x) = \begin{cases} x^2 - 2x + 2, & x < 3 \\ \sqrt{x^3 - 2} & x \geq 3 \end{cases}$$

at  $x = 3$ .

2. Find the derivative of  $f(x) = \sqrt{x+1}$  using the definition of the derivative. (You are not supposed to use the power rule in this problem!)

a) (5pt) Write the definition of  $f'(x)$ ;

b) (3pt) Apply the definition of derivative to the function  $f(x) = \sqrt{x+1}$ ;

c) (12pt) Find  $f'(x)$  by evaluating the limit in b).

3. Evaluate the indicated derivatives

a) (5pt) Find  $f'(x)$  if

$$f(x) = \arcsin(x) + \sin(2);$$

b) (5pt) Find  $g''(x)$  if

$$g(x) = \tan(x);$$

c) (5pt) find  $h'''(x)$  if

$$h(x) = x^n.$$

4. Use chain rule to evaluate the following derivatives

a) (5pt) Find  $f'(x)$  if

$$f(x) = (\cos x + 1)^{10}$$

b) (5pt) find  $g'(x)$  if

$$g(x) = \sqrt{1 + \cot^2(x)}$$

c) (10pt) find  $h'(x)$  if

$$h(x) = \sin(x + \sqrt{x^2 + 1})$$

5. (15pt) Use implicit differentiation to find  $y'(x)$  at  $(1, -2)$

$$xy^2 + 2x^3 = xy - y^3.$$

6. A lady is walking a dog on a leash. If lady's hand is 3ft above the ground, and the leash is being released at the rate of 2ft/s, at how fast is the dog escaping from the lady when 5ft of the leash is out. (see the picture)