

**Exam 2**

Name \_\_\_\_\_

Math 143

Fall 2007

Halloween, 2007

**Show all work and simplify all answers.** There are 3 pages and 100 points: budget your time on each problem effectively. NPC means no partial credit.

1. [18 points]

(a) [NPC] What is the vertex of  $y = 3(x + 5)^2 - 2$ ?

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(b) [NPC] True or false: the graph of every cubic polynomial has two turning points.

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(c) Find all asymptotes to the graph of  $f(x) = \frac{2x + 3}{9x - 5}$ . Give the exact equation of each line.

Horizontal asymptotes: \_\_\_\_\_

Vertical asymptotes: \_\_\_\_\_

Slant asymptotes: \_\_\_\_\_

(d) [NPC] The values of a function  $f$  are given in the table. Find  $f^{-1}(3)$ .

$x$	1	2	3
$f(x)$	3	5	2

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(e) [NPC] Express the diameter  $d$  of a circle as a function of its circumference  $C$ .

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2. [10 points] Find the inverse of  $f(x) = \frac{2}{x-1}$ .

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3. [10 points] Find  $H(2)$  if  $H$  is a linear function with  $H(0) = 5$  and  $H(3) = 2$ .

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4. [10 points] Complete the square to put  $y = -2x^2 + 6x$  in standard form. Show all steps.

5. [10 points] Suppose that  $P(x, y)$  is a point on the parabola  $y = x^2$  and  $Q$  is the point  $(0, 2)$ . Express the distance  $PQ$  as a function of  $x$ .

6. [20 points] What is the largest possible area for a rectangle having perimeter 60 feet?
- (a) Draw a picture and label variables.
  
  
  
  
  
  
  
  
  
  
  - (b) Write down the function you are trying to optimize, first as a function of two variables, then as a function of one variable.
  
  
  
  
  
  
  
  
  
  
  - (c) Find the max or min of your function. Justify your conclusion.
  
  
  
  
  
  
  
  
  
  
  - (d) State your conclusion. Be sure to check your answer with your common sense and to use appropriate units.
7. [22 points] Let  $f(x) = (x - 2)(x + 3)^2$ .
- (a) Determine all intercepts for the graph of  $f$ .
  
  
  
  
  
  
  
  
  
  
  - (b) Make a sign table for  $f$ .
  
  
  
  
  
  
  
  
  
  
  - (c) Determine the behavior of  $f$  when  $x$  is very close to  $-3$ .
  
  
  
  
  
  
  
  
  
  
  - (d) Graph  $f$ . Start by shading in the excluded regions. Be sure to show the large-scale behavior of  $f$ .