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Math 114, Lecture 1

Exam # 2

October 24, 2003

YOUR NAME: \_\_\_\_\_

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Do all six problems. Each part is worth the indicated number of points. There are 100 points altogether. Do not spend too much time on any one problem. There are eight printed pages in this exam, including this cover page.

Page	Possible points	Your score
Page 2	16	
Page 3	16	
Page 4	16	
Page 5	16	
Page 6	8	
Page 7	12	
Page 8	16	
<b>TOTAL</b>	<b>100</b>	

**Problem 1**

(a) (8 points) Find the quotient and remainder if the polynomial  $f(x) = x^4 - 3x^3 + 2x - 1$  is divided by the polynomial  $p(x) = x^2 - 2x + 3$ . Write your answers in the indicated places below.

Quotient =

Remainder =

(b) (8 points) Find the polynomial of degree 4 with real coefficients which has a root at  $2 + i$ , a root of multiplicity 2 at  $x = 0$ , and has leading coefficient 2. Completely multiply out your answer.

**Problem 2** Solve each of the following equations. Your answers should not involve logarithms or exponentials.

(a) (9 points)  $\log(x) = \log(3) + \log(x + 2) - \log(x - 2);$

(b) (7 points)  $3^{2x} = \frac{\sqrt{3}}{27^x};$

**Problem 3** Find the solutions to each of the following equations:

(a) (6 points)  $x^4 - 4x^2 + 2 = 0$ ;

(b) (10 points)  $2x^3 - 3x^2 - 4x - 1 = 0$ .

**Problem 4** (12 points)

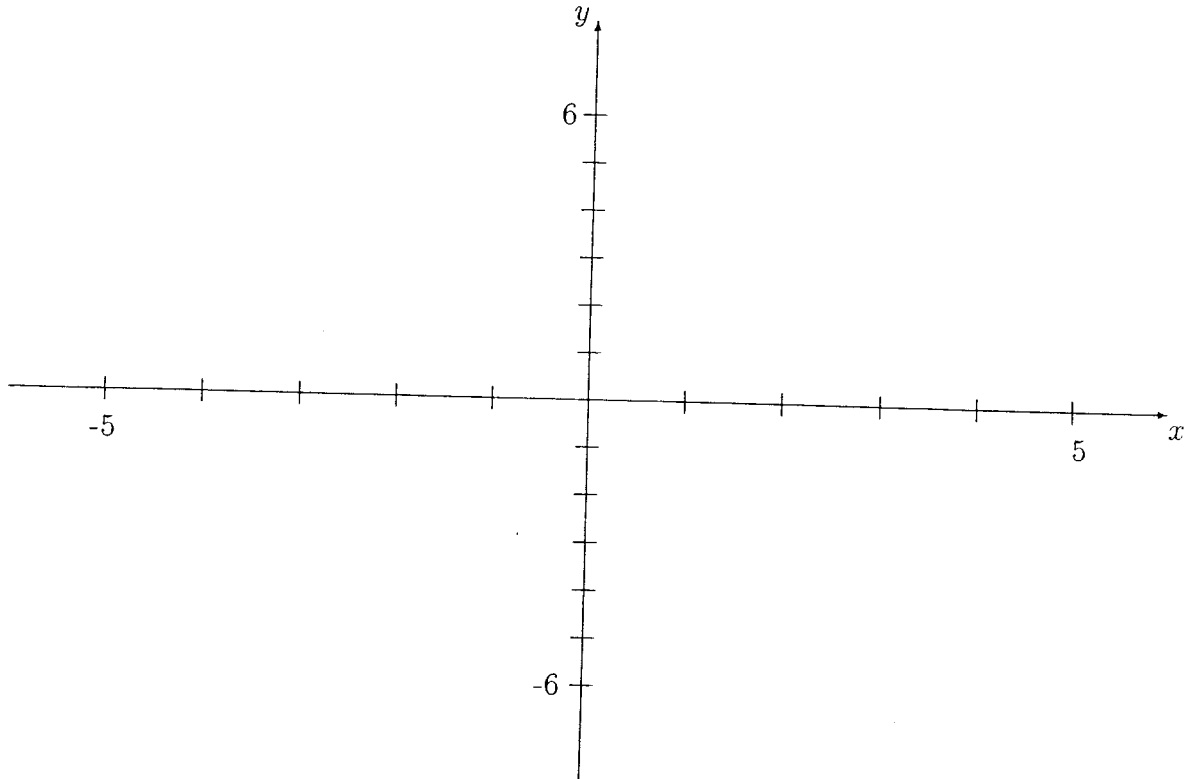
(a) (4 points) What are the domains of the two functions  $f(x) = 10^{-2x}$  and  $g(x) = \log_3(x - 2)$ ? Write your answers in interval form.

Domain of  $f(x) =$

Domain of  $g(x) =$

(b) (6 points) On the grid below, sketch the graphs of the two functions

$$y = f(x) = 10^{-2x} \quad \text{and} \quad y = g(x) = \log_3(x - 2).$$



(c) (6 points) Using information from the graphs in part (b), what can you say about the number of solutions to the equation  $10^{-2x} = \log_3(x - 2)$ ? (Do not try to solve the equation!)

**Problem 5** (12 points) Consider the rational function

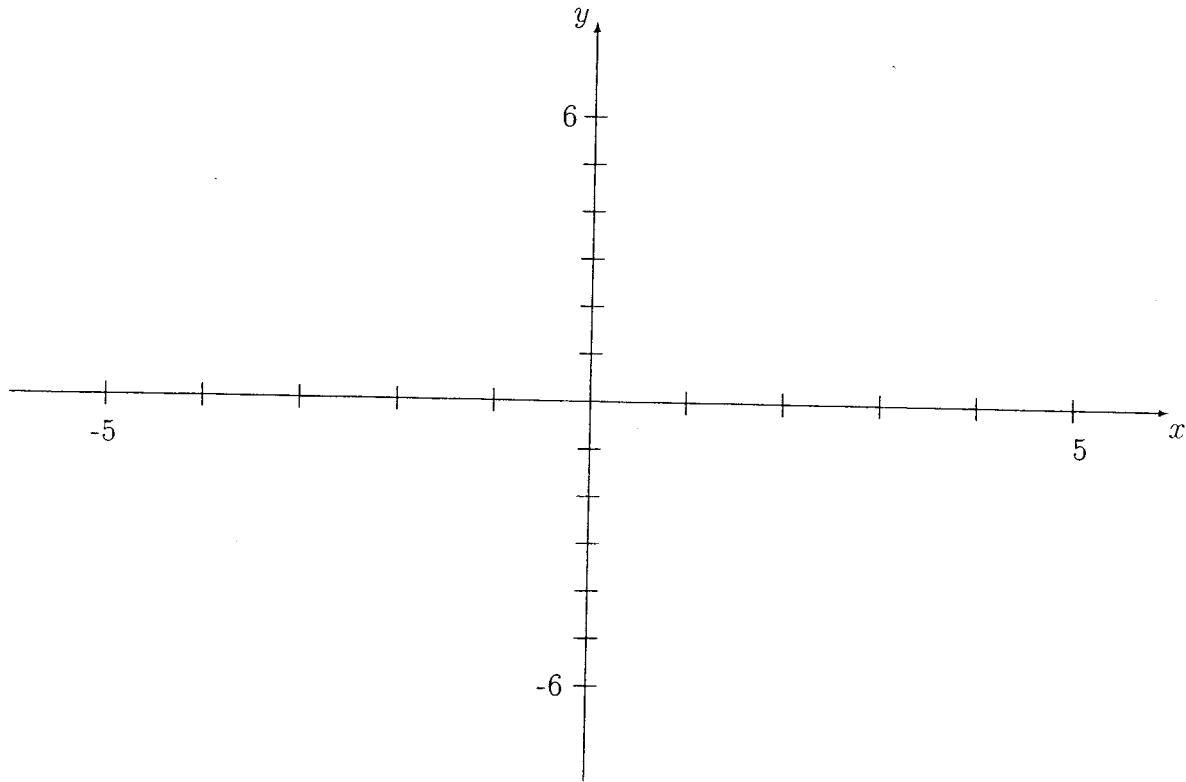
$$f(x) = \frac{2x^2 - 2x}{x^2 - 2x - 3}.$$

- (a) (2 points) What is the domain of  $f(x)$ ?
- (b) (2 points) What is the  $y$ -intercept of the graph  $y = f(x)$ ?
- (c) (2 points) What are the  $x$ -intercepts of the graph  $y = f(x)$ ?
- (d) (2 points) What are the vertical asymptotes of the graph  $y = f(x)$ ?

**Problem 5 continued:**

(e) (4 points) Is there a horizontal asymptote for the graph  $y = f(x)$ ? If so, what is it?

(f) (8 points) Sketch the graph of  $y = f(x)$ :



**Problem 6** I invest \$5,000 in a bank which pays 2% interest per year.

(a) (8 points) How long does it take for my investment to triple in value if the bank compounds quarterly? Write your answer in terms of natural logarithms.

(b) (8 points) How long does it take for my investment to triple in value if the bank compounds continuously? Write your answer in terms on natural logarithms.