

Name:

11/22/04

Math 111–Midterm 2

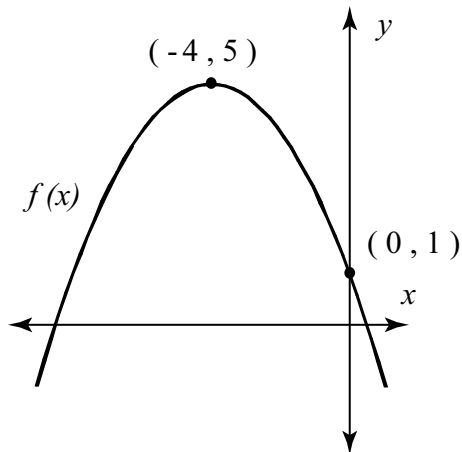
Be sure to show all your work in a step by step fashion and clearly indicate your answers. The point value for each problem is labelled next to the problem number.

1. [10pts] Find the remainder when  $2x^3 - 2x + 3$  is divided by  $x^2 - 3x + 2$ .

2. [10pts] Write the following expression as a single logarithm.

$$3 \ln(x) + 4 \ln(y) - \ln(x^3) - 2 \ln(z)$$

3. [15pts] Let  $f(x)$  be the function whose graph is a parabola with vertex  $(-4, 5)$ , which passes through the point  $(0, 1)$ . Find the rule for  $f(x)$ .

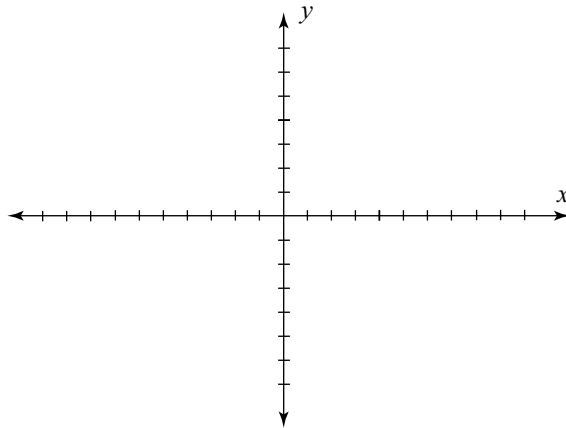


4. [15pts] Let

$$f(x) = \frac{3x^2 - 6x}{x^3 - 6x^2 + 8x}.$$

(i) Find all the holes, vertical asymptotes, and horizontal asymptotes in the graph of  $f(x)$ .

(ii) Sketch a complete graph of  $f(x)$ .



5. [10pts] Let  $a$  and  $b$  be positive real numbers. Simplify the following expression:

$$\frac{\sqrt[6]{a^{-3}b}}{a^{-2}b^{1/6}a}$$

6. [10pts] Solve the following inequalities and express your answers in interval notation.

(i)

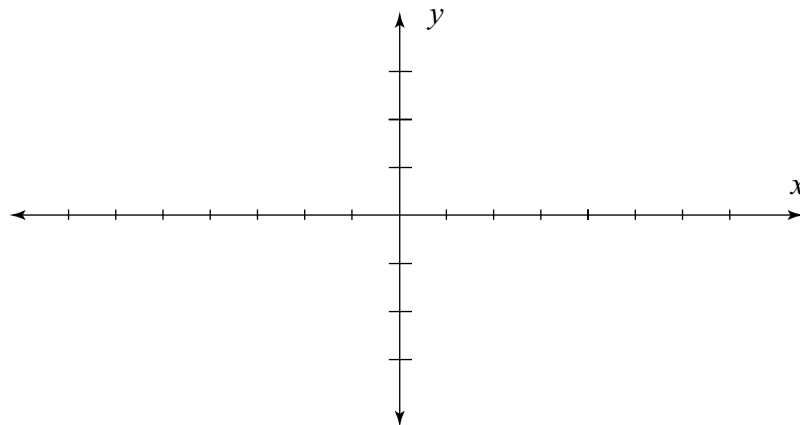
$$|4x + 2| < 1$$

(ii)

$$|3x + 2| \geq 4$$

7. [10pts] Sketch a complete graph of a polynomial function  $f(x)$  which satisfies ALL of the following three conditions.

- (i) The degree of  $f(x)$  is even.
- (ii) The leading coefficient of  $f(x)$  is negative.
- (iii)  $f(x)$  has three roots, exactly one of which is of even multiplicity.



8. [10pts] What amount of money,  $A$ , will be in a savings account after 2 years if the initial deposit was \$317, and the interest rate is 13% compounded continuously?

(You do NOT need to simplify your answer)

9. [10pts] Let

$$f(x) = 3x^{23} - 2x^2 - x.$$

(i) Is  $x - 1$  a factor of  $f(x)$ ? (Justify your answer)

(ii) Is  $x + 1$  a factor of  $f(x)$ ? (Justify your answer)

10. [10pts] (i) For any positive real numbers  $b$  and  $v$ , with  $b \neq 1$ , find the value of

$$b^{\log_b(v)}$$

(ii) Give a clear justification (in words) for your answer in part (i).