

Name:

5/23/05

Math 111–Exam 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. (3pts each) True or False:

(a) A polynomial function of degree 7 can have 6 real roots.

(b) If $x + 1$ is a factor of a polynomial function $f(x)$, then $x - 1$ is also a factor of $f(x)$.

(c) $x + 1$ is a factor of $x^4 - 15x - 16$.

(d) The range of some quadratic functions is $(-\infty, \infty)$.

2. (10pts) For what values of x is $|x^2 - 1| \leq 8$? Give your answer in interval notation.

3. (10pts) Suppose that I invest \$400 at 13% compounded quarterly and I do not withdraw any money. How much money will I have after 3 years?

(You do NOT need to simplify your answer)

4. (10pts) Recall that the area A of a rectangle is given by $A = lw$ where l is the length and w is the width. If a rectangle has the property that the sum of its length and 3 times its width is 12, what is the maximal area of the rectangle?

(You must show work to justify your answer)

5. (10pts) Let $f(x) = x^4 + 6x^3 - 7x^2 - 60x$. Use long division and the fact that $f(-4) = 0$ to find all the roots f .

6. (10pts) Suppose the graph of quadratic function f has vertex $(4, 1)$ and passes through the point $(2, -11)$. Write down the rule of $f(x)$.

7. (3pts each) Let f be the rational function whose rule is given by

$$f(x) = \frac{4(x+2)(x-3)^3(x+1)^2}{8(x+2)^2(x-3)^2(x+1)^3}.$$

- (a) State the domain of f .

- (b) State the horizontal asymptote of the graph of f .

- (c) Find all vertical asymptotes of the graph of f (if any exist).

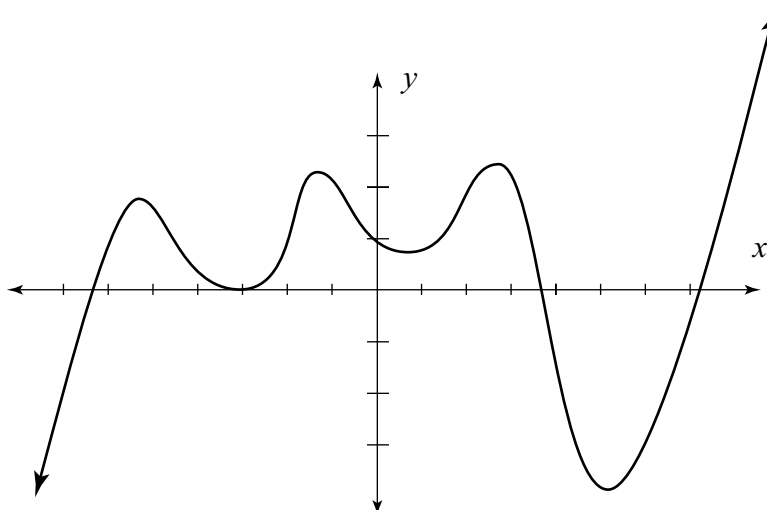
- (d) Find all x -values of holes in the graph of f (if any exist).

- (e) Give the (x, y) -coordinates of all the holes of the the graph of f (if the graph has any holes).

- (f) Find the y -intercept of the graph of f (if one exists).

- (g) Find the x -intercept(s) of the graph of f (if any exist).

8. (3pts each)



Above is a complete graph of the polynomial function f . Circle the correct answer.

- (a) The degree of $f(x)$ is
- i. even
 - ii. odd
 - iii. neither even nor odd
- (b) The leading coefficient of $f(x)$ is
- i. positive
 - ii. negative
 - iii. zero
- (c) The degree of $f(x)$ COULD be
- i. 4
 - ii. 5
 - iii. 8
 - iv. 11
 - v. none of the above
- (d) How many roots of odd multiplicity does f have?
- i. 0
 - ii. 1
 - iii. 2
 - iv. 3
 - v. 4
 - vi. none of the above

9. (10pts) Simplify (a and b are positive real numbers)

$$\frac{(9a^2b^{-3})^{1/2}}{b^{-2}(27a)^{-1/3}}$$

Bonus: (10pts) Find all real numbers x which satisfy the following equation.

$$x^4 + x = 2x^3.$$