

Name _____

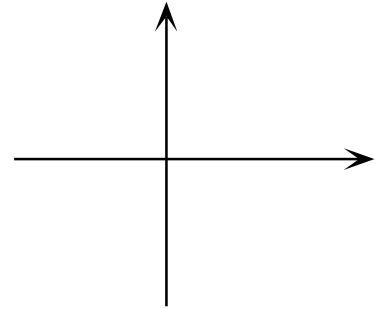
MATH 4
Exam 3
September 30, 1997

Instructor _____

Section _____

Show All work to receive partial/full credit.

- [6] 1. Sketch the graphs of $f(x) = x^3$ and $g(x) = (x-2)^3 - 2$ on the same set of axes.



- [5] 2. Divide by long division. $(6x^3 + 10x^2 + x + 8) \div (2x^2 + 1)$

- [5] 3. Use synthetic division to find $f(-2)$ for $f(x) = 4x^3 - 13x + 10$.

4. On parts a), b), and c), refer to the function $f(x) = 4x^5 - 8x^4 - 5x^3 + 10x^2 + x - 2$.

- [4] a) Determine the left and right hand behavior of the graph of f .

- [4] b) Use Descartes's Rule of Signs to determine the possible number of positive and negative real zeros of f .

[4] c) Use the Rational Zeros Test to list all the possible rational zeros of f .

5 True or false. For the function $f(x) = 2x^3 - 3x^2 - 12x + 8$:

[3] a) $x = 4$ is an upper bound for the zeros of f .

[3] b) $x = -1$ is a lower bound for the zeros of f .

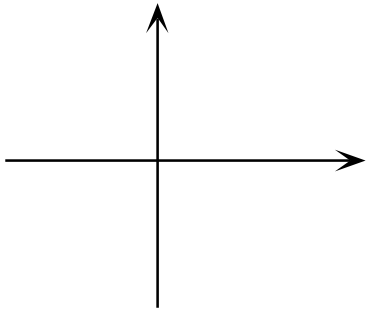
[10] 6. Find ALL the zeros of the function $h(x) = x^4 + 6x^3 + 10x^2 + 6x + 9$.

Zeros are: _____

[5] 7. Find a polynomial function with integer coefficients that has 4 and $3i$ as zeros.

[12] 8. For the function $f(x) = \frac{x-3}{x+2}$ do the following:

- Find the y-intercept;
- Find the x-intercept;
- Find the vertical asymptote(s);
- Find the horizontal asymptote(s);
- Plot additional points;
- Graph the function.



[5] 9. a) Set up the partial fraction decomposition for: $\frac{x^2 + 3}{(x - 1)(x^2 + 1)}$ **DO NOT SOLVE**

[8] b) Write the partial fraction decomposition for $\frac{x + 3}{(x^2 + x - 2)}$ **SOLVE FOR A, B, C, etc.**

[10] 10. Find the center, and vertices of the hyperbola and sketch its graph.

$$9x^2 - y^2 - 36x - 6y + 18 = 0$$

center: _____

vertices: _____

[8] 11. Find an equation of the parabola with vertex (3, 2) and focus (1, 2).

[8] 12. Identify the conic section by its equation. (2 points each)

A. $12x^2 + 20y^2 - 12x + 40y - 37 = 0$

B. $4x - y^2 - 2y - 33 = 0$

C. $9y^2 - x^2 + 2x + 54y + 62 = 0$

D. $3x^2 + 3y^2 - 5x + 4y = 0$

BONUS 5 POINTS

A semielliptical arch over a tunnel for a road through a mountain has a major axis of 100 feet and a height at the center of 30 feet.

a) Make a sketch to solve the problem. Draw a rectangular coordinate system on the tunnel with the center of the road entering the tunnel at the origin. Identify the coordinates of the known points.

(b) Find an equation of the elliptical tunnel.

(c) Determine the height of the arch 5 feet from the edge of the tunnel.