NAME_____ Math 4

Instructor_____ Test 3

Class Time_____ Fall 1998

You must *show all work* to receive full credit. Each question is worth the indicated value, for a total of 100 points possible. If you have any questions, please come to the front and ask or raise your hand.

1. (12 points) Describe the graph of each of the following equations as a circle, ellipse, parabola, hyperbola, or none of these:

   a) $3x^2 + 6x - 4y + 12 = 0$

   b) $3x^2 + 3y^2 - 6x + 18y + 10 = 0$

   c) $3x^2 - 2y^2 + 6x - 8y + 1 = 0$

   d) $x^2 + 2x + 4y^2 + 1 = 0$

   e) $2x^2 - 5y^2 + 4x - 6 = 0$

   f) $2x^2 - 3xy + 4y^2 - x + y - 3 = 0$

2. (6 points) Find a 6^{th} degree polynomial whose *only* zeros occur at 1, 0, and 3. You may leave your answer in factored form, do not multiply it out.

3. (8 points) Rewrite after performing the division:

$$f(x) = \frac{6x^3 - x^2 - 10x + 1}{3x + 1} =$$

4. (10 points) Find the equation of the parabola with vertex $(1,-1)$ and focus (1,0).

5. (10 points) Find all intercepts and asymptotes of $f(x) = \frac{x^2 + x - 2}{x - 3}$, and sketch the graph of *f*. *Be sure to label your graph*.

6. (6 points) List all the possible rational roots of $f(x) = 3x^5 + 2x^2 - 3x + 2$.

7. (8 points) Circle True or False:

T F $f(x) = x^3 + 2x^2 + x + 2$ has 3 negative real roots and no positive real roots.

T F On a graph of a parabola, the focus is located inside the parabolic curve.

T F An ellipse is a set of points, the sum of whose distances from two fixed points is constant.

T F $f(x) = \dfrac{x^2 + 2x - 3}{x + 3}$ has a vertical asymptote at $x = -3$.

8. (8 points) Sketch the graph of $9x^2 + 4y^2 = 36$, labeling all vertices.

9. (8 points) Suppose $3i$ is a root of $f(x) = x^4 - 6x^3 + 14x^2 - 54x + 45$. Find *all* the remaining roots.

10. (8 points) Find the partial fraction decomposition of $\dfrac{2x^2 + 6x - 11}{(x-3)(x+2)^2}$.

11. (6 points) Write $4x^2 - 5y^2 - 16x + 30y - 9 = 0$ in standard form.

12. (10 points) Write $f(x) = x^4 - 3x^2 - 28$ as a product of factors irreducible over the rationals. As a product of factors irreducible over the real numbers. As a product of linear factors.

Irred. over rationals, $f(x) =$_____

Irred. over reals, $f(x) =$_____

Linear factors, $f(x) =$_____