Answer the problems on separate paper. You do <u>not</u> need to rewrite the problem statements on your answer sheets. Work carefully. Do your own work. **<u>Show all relevant supporting steps!</u>**

1. (24 pts)   Sketch and discuss the graph of $x^2 + 9y^2 + 10x - 36y + 52 = 0$. Specifically, identify:

         a.   center,
         b.   vertices,
         c.   covertices,
         d.   foci,
         e.   major axis,
         f.   minor axis.

2. (10 pts)   Find the equations of rotation which would be used to eliminate the *xy* term in

$$4x^2 + 4xy + 4y^2 - 16\sqrt{2}x - 16\sqrt{2}y = 0.$$

Do <u>not</u> substitute the equations of rotation into the equation. Do <u>not</u> sketch the graph the equation.

3. (12 pts)   Test the following equation for symmetry in the graph of the equation. For each test type (x-axis, y-axis, origin) explicit show the test and state the conclusion which you draw from the test.

     a. $y = 2x^2 - x^4$

Do not graph the equation.

4. (16 pts)   For each of the following equations find all of the intercepts of the graph of the equation.

     a. $y = \dfrac{(x+3)(x-2)^2}{x(x+2)}$ b. $y = \dfrac{x-4}{(x+2)^2(x-1)}$

Do not graph the equations.

5. (16 pts)   For each of the following equations find all of the asymptotes of the graph of the equation.

a. $y = \dfrac{2x+3}{x+6}$ b. $y = \dfrac{x+3}{(x-2)(x+1)}$

Do not graph the equations.

6. (24 pts)   Use the methods given in chapter 7 to sketch the graph of $y = \dfrac{(x+1)(x-6)}{(x-2)^2}$,

i.e., specifically identify

      a.   any intercepts which the graph might possess,
      b.   any vertical asymptotes which the graph might possess,
      c.   any horizontal asymptotes which the graph might possess,
      d.   any slant asymptotes which the graph might possess,
      e.   intervals (on the x-axis) on which the sign of the graph is constant.

Use the above information to sketch the graph. Do not plot the graph point by point.