Math 1210-90 Calculus I
Examination 2, Oct 23,25, 2003
WARNING: You must show work, particularly where graphing is involved.

1. A curve in the plane is given implicitly by the equation

$$2x^2 + 2xy + 3y^2 = 40 \ .$$

At what points does the curve have a horizontal tangent line?

2. A pool filled with water is shaped like a box lying over a rectangle of area 60 ft^2. Because of a break in the bottom, water begins to leak out of the pool at a rate proportional to the volume V of water in the pool according to the formula

$$\frac{dV}{dt} = \frac{1}{20}V \ .$$

V is measured in ft^3 and time in minutes. At what rate is the height of the water in the pool decreasing when the height is 6 feet? Remember that the volume of water is equal to the area of the base times the height of the water.

3. What point on the line $2x + y = 10$ is closest to the origin?

4. What is the maximum of $y = \dfrac{x}{x^2+1}$?

5. Graph $y = \dfrac{x^2}{x^2-1}$

showing clearly in what intervals the graph is increasing and decreasing.