MATH 1351 TI-85 EXERCISE IX
Graphing relations on the TI-85

Name: ____________________________ SID: ______________________________

Section 3.6 of the text involves differentiating a relation in x and y with respect of x while treating y as a dependent variable related to x in some unknown way. Even without an explicit formula for y we can compute dy/dx if we know the value of a point (x , y) satisfying the original relation. The purpose of this exercise is to demonstrate that if the relation is *quadratic in y* we can solve (using the quadratic formula if necessary) for two explicit formulas for y. Once this is done we graph both on the TI-85, thereby obtaining a graph of the original relation. Then we can use **TANLN** from the **GRAPH/MATH** menu to draw the tangent line and display dy/dx at each of the two points corresponding to a single value of x. It is hoped that this will demonstrate how a relation can involve multiple explicit functions, and implicit differentiation can give information about the behavior of any one of them if provided explicit data (x and y values) for it.

Let's begin with the circle described by the relation **x^2 + y^2 = 4.** Suppose we are interested in the tangent line(s) at the point(s) on the circle with x coordinate = 1.

a. What are the corresponding possible value(s) for y?______________ & _______________

b. Use implicit differentiation to derive a formula for dy/dx in terms of x and y:

dy/dx =

____

c. What are the slopes of the two tangent lines to the graph at the two points with x=1?

_____________ & ____________

d. "Solve for y" to obtain two explicit formulas

1. y = + _______________ & 2. y = - _________________

e. On the TI-85 graph both on the same screen. A good window for the rest of this exercise is obtained by first using **ZDECM**, then **ZSQR** (so the x-step is .1 and the picture is squared up). Notice how both functions are graphed left to right with the final picture being the graph of the original relation. (**SimulG** format has a nice effect here in that you get to see both functions being graphed simultaneously to complete the graph of the original relation.)

f. Draw the tangent lines at each of the two points with the specified value of x, and record the corresponding slopes as furnished by the machine:

dy/dx = _____________ & dy/dx = _______________

These should be the same as calculated "by hand" in part c. If not check your work.

Repeat steps a through f for each of the following relations, at the indicated value of x. You may have to use the quadratic formula, treating x as if it were a constant, to solve for the two explicit formulas for y. Attach the results on a separate piece of paper.

1. **x^2 - y^2 = 1 ,** at x = 2.

2. **y^2 - xy - 1 = 0** , at x = 0.

3. **y^2 + xy + x = 1** , at x = 0.

4. **(x^2)(y^2) = 9** , at x = 1.

5. **xy^2 + (x^2)y - 6 = 0** , at x = 1.

6. **y^2 + xy - 1 = 0 ,** x = 1.