3.1 A
A.P. Calculus

Name _____
Partner _____

Objective: Explore graphs and derivatives of implicitly defined functions.

Show all work on another sheet of paper

1. Given the function defined as $x^2y = 4$,
   a. **Use implicit differentiation** to find the derivative y'.

   b. **Find the slope of the tangent line** to the curve at (-2 , 1). _____

   c. Solve the equation for y in terms of x and graph the function. Show the graph.

   d. Use your calculator to evaluate the derivative of the function you graphed in part c above at the point (-2 , 1) to check your answer in part b.

   e. Write the **equation of the tangent line** to $x^2y = 4$ at (-2 , 1) and graph it. Show the line on your graph.

2. Given the function defined as $y^2(2-x) = x^3$,
   a. **Use implicit differentiation** to find the derivative y'.

   b. Find the **slope of the tangent line** to the curve at (1 , -1). _____

   c. Solve the equation for y in terms of x and graph the function. Show the graph.

   d. Use your calculator to evaluate the derivative of the function you graphed in part c above at the point (1, -1) to check your answer in part b.

   e. Write the **equation of the tangent line** to $y^2(2-x) = x^3$ at (1 , -1) and graph it. Show the line on your graph

3. Given the function defined as $x^2 + xy + y^2 = 7$.
   a. **Use implicit differentiation** to find the derivative y'.
   (Hint: Don't forget to use the product rule on xy).

   b. Find the **slope of the tangent line** to the curve at (-2 , -1). _____

   c. Solve the equation for y in terms of x and graph the function(s). Show the graph.
   (Hint: To solve for y you need to use the quadratic formula. Let a= ____, b= _____, c= _____)

   d. Use your calculator to evaluate the derivative of the function you graphed in part c above at the point (-2 , -1) to check your answer in part b.

   e. Write the **equation of the tangent line** to $x^2 + xy + y^2 = 7$ at (-2 , -1) and graph it. Show the line on your graph

4. Given the function defined as $x^2y + xy^2 = 6$.

a. Use **implicit differentiation** to find the derivative y'.
(Hint: Don't forget to use the product rule on xy).

b. Find the **slope of the tangent line** to the curve at (1 , -3). _____

c. Solve the equation for y in terms of x and graph the function(s). Show the graph.
(Hint: To solve for y you need to use the quadratic formula. Let a= ____, b= _____, c= _____)

d. Use your calculator to evaluate the derivative of the function you graphed in part c above at the point (1 , -3) to check your answer in part b.

e. Write the **equation of the tangent line** to $x^2y + xy^2 = 6$ at (1 , -3) and graph it.
Show the line on your graph

5. Given the function defined as $2e^{xy} - x = 0$.

a. Use **implicit differentiation** to find the derivative y'.
(Hint: Don't forget to use the product rule on xy).

b. Find the **slope of the tangent line** to the curve at (2 , 0). _____

c. Solve the equation for y in terms of x and graph the function(s). Show the graph.
(Hint: To solve for y you need to use properties of logs).

d. Use your calculator to evaluate the derivative of the function you graphed in part c above at the point (2 , 0) to check your answer in part b.

e. Write the **equation of the tangent line** to $2e^{xy} - x = 0$ at (2 , 0) and graph it.
Show the line on your graph