

Assignment 9: Implicit Differentiation (2.8)
Please provide a handwritten response.

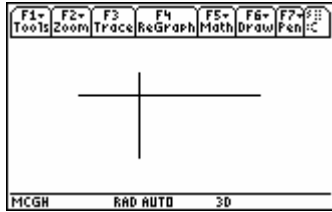
Name _____

- The implicit function $x^2y^2 - 2x = 4 - 4y$ is readily differentiated on your calculator. Enter $d(x^2(y(x))^2 - 2x - 4 + 4y(x), x)$ and press enter. Now you need to substitute for $\frac{d}{dx}(y(x))$. This is achieved by clearing the entry line, **arrowing up** to the history line, **highlighting** $(2 \cdot y(x) \cdot x^2 + 4) \frac{d}{dx}(y(x)) + 2 \cdot (y(x))^2 \cdot x - 2$ and pressing **enter**. With this expression in the entry line, add $/d(y(x), x) = dy$ at the end of the expression to change $\frac{d}{dx}(y(x))$ to dy . (Use **2nd 8 (d)** for $d(y(x), x)$ and **alpha d** for dy .) You can solve for dy using the **solve** command. Note that your calculator will NOT solve for $\frac{d}{dx}(y(x))$ directly so you must substitute to use the **solve** command. Now solve $2 \cdot (y(x))^2 \cdot x + 2 \cdot dy \cdot y(x) \cdot x^2 + 4dy - 2 = 0$ for dy to find the derivative of this function and record the result below. Find the slope of the tangent line to $x^2y^2 - 2x = 4 - 4y$ at $(2, -2)$ by entering $dy = \dots / x = 2$ and $y(x) = -2$. Record your result below.

- Enter this function into $Y_1=$ on your calculator as $Y_1 = x^2y^2 - 2x - 4 + 4y$ and graph it using the appropriate instructions below.

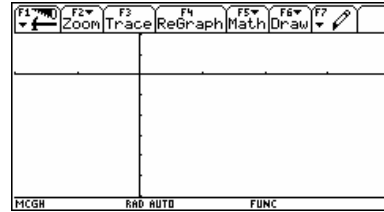
	TI-89	Voyage 200
GRAPHING AN IMPLICIT FUNCTION	Set MODE to Graph 3D . Enter $z1(x, y) = x^2y^2 - 2x - 4 + 4y$ in $\blacklozenge Y=$ Set GRAPH FORMATS (Access from $\blacklozenge Y=$ screen by typing F1 9 Axes...AXES Style... IMPLICIT PLOT) Set WINDOW $-2 \leq x \leq 4, -6 \leq y \leq 2$ (leave other settings alone) Press \blacklozenge GRAPH to graph the function. Save the graph by CATALOG StoPic imp1 ENTER	Enter the implicit function $Y_1 = x^2y^2 - 2x - 4 + 4y$ in Y_1 and deselect the function by highlighting and pressing F4 Set the WINDOW . In this case set $-2 \leq x \leq 4, -6 \leq y \leq 2$ Run the program IMPGRAPH . After exiting the program (2nd ESC) save the graph by CATALOG (2ND 2) StoPic imp1 ENTER

Sketch the graph on the axes provided below. Draw continuous curves, not just the ‘dots’ that occur from the resolution of the calculator screen.



$$-2 \leq x \leq 4, -6 \leq y \leq 2$$

TI-89

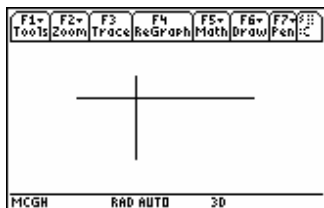


$$-2 \leq x \leq 4, -6 \leq y \leq 2$$

Voyage 200

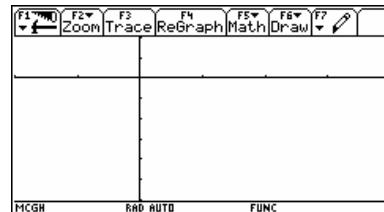
3a. Draw a tangent line to the graph at (2,-2) and record the graph below.

	TI-89	Voyage 200
DRAWING A TANGENT LINE TO AN IMPLICIT PLOT	Set MODE to Graph 3D . Enter $z1 = (7/6)(x - 2) - y - 2$ in ♦ Y= leaving all other settings as in 2. Press ♦ GRAPH to graph the function. QUIT the graph (2nd ESC), enter (from catalog) RclPic imp1 ENTER	Enter $y1 = (7/6)(x - 2) - 2$ in ♦ Y= leaving all other settings as in 2. Press ♦ GRAPH to graph the function. QUIT the graph (2nd ESC), enter (from catalog) RclPic imp1 ENTER



$$-2 \leq x \leq 4, -6 \leq y \leq 2$$

TI-89

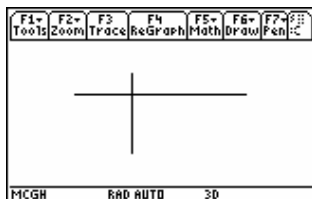


$$-2 \leq x \leq 4, -6 \leq y \leq 2$$

Voyage 200

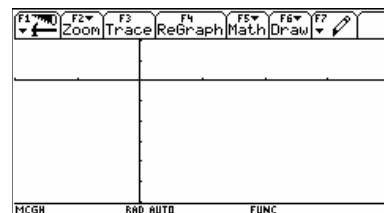
3b. Find the slope of the tangent line to $x^2y^2 - 2x = 4 - 4y$ when $x = 2.235$. You will need to find the corresponding y value by solving the equation in 1a for y when $x = 2.235$. How many points on this curve satisfy the condition $x=2.235$? Find both corresponding values of y using the **Solve** command.

3c. Repeat 3a with each value of y found in 3b and record both results on the graph below.



$$-2 \leq x \leq 4, -6 \leq y \leq 2$$

TI-89



$$-2 \leq x \leq 4, -6 \leq y \leq 2$$

Voyage 200