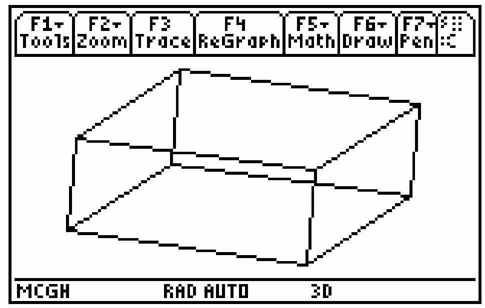
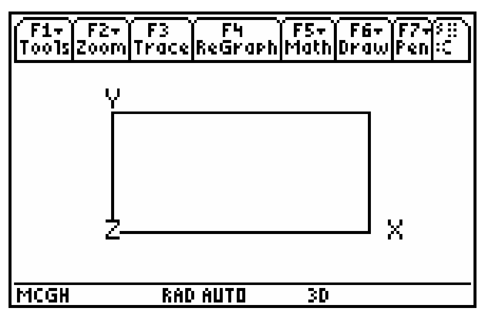
Assignment 27: Functions of Two Variables (12.1-2) Name________________________
Please provide a handwritten response.

1a. To graph the function $f(x,y) = sin(y - x^2)$ change the **MODE** to **3D** and enter $\boldsymbol{z1 = sin(y - x \wedge 2)}$ from ♦**Y=.** While still in the ♦**Y=** editor select **F1 Tools, 9 Format.** Set **Coordinates** to **RECT**, **axes** to **BOX, Labels** to **ON, Style** to **HIDDEN SURFACE.** Set Window to ***eyeθ* = –68.13, *eyeϕ* = 50.89, *eyeΨ* = –2.47, *xgrid*= 14, *ygrid*=14,** $\boldsymbol{-2 \le x \le 2, -2 \le y \le 2, -1 \le z \le 1}$. You can rotate the graph using the arrow keys. Record the general shape of the graph below.

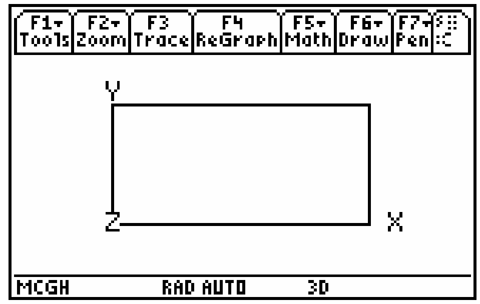


1b. Graph $f(x,y)$ over a wider range and describe the general appearance of the resulting surface.

1c. Draw a contour plot of this function by going to **Format (F1 Tools 9)** and changing **Style** to **CONTOUR LEVELS.** Set ***eyeθ* = –90, *eyeϕ* = 0, *eyeΨ* = 0** in the window. Sketch the result on the axes below.

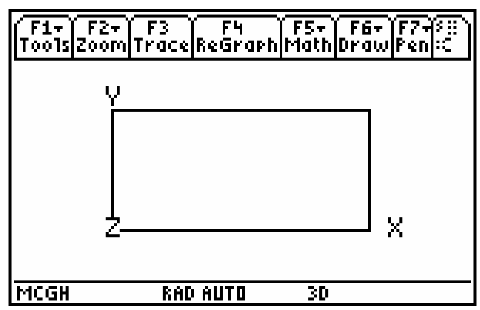


2a. Contour plots can be used to show that $\lim_{(x,y)\to(0,0)} \frac{x^2 y}{x^2 + y^2} = 0$ and that $\lim_{(x,y)\to(0,0)} \frac{x^2}{x^2 + y^2}$ does not exist. Enter $\boldsymbol{z1 = x \wedge 2y/(x \wedge 2 + y \wedge 2)}$ for $\boldsymbol{-.1 \le x \le .1, -.1 \le y \le .1}$ and record the result below. Repeat with the window changed to $\boldsymbol{-.07 \le x \le .07, \ -.07 \le y \le .07}$.



2b. How do these graphs support the conclusion that $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^2 y}{x^2+y^2}$ exists?

2c. Now examine $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^2}{x^2+y^2}$ by graphing a contour plot of $z3 = x \wedge 2 / \left(x \wedge 2 + y \wedge 2\right)$. Set your window to $-.01 \le x \le .01, -.01 \le y \le .01$. Repeat with the window changed to $-.001 \le x \le .001, -.001 \le y \le .001$. Record your results below.



2d. How do these graphs support the conclusion that $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^2}{x^2+y^2}$ does not exist?

2e. Based on contour plots, do you think that $\lim\limits_{(x,y)\to(0,0)} \dfrac{x \sin y}{x^2+y^2}$ exists? Explain your answer.