Name: Date: 09/28/2017

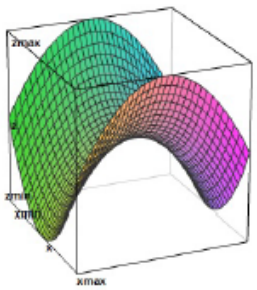
M20550 Calculus III Tutorial
Worksheet 4

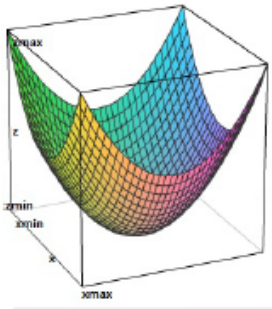
1. Find and sketch the domain of the function

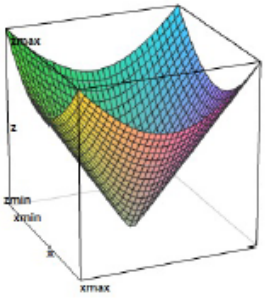
$$f(x,y) = \frac{\ln(x^2 + 4y^2 - 4)}{9 - x^2}.$$

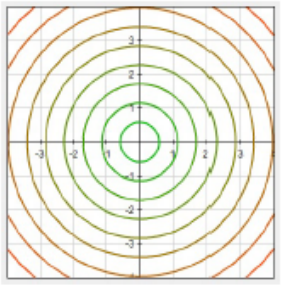
2. Select the correct graph and the correct contour plot of level curves for the function

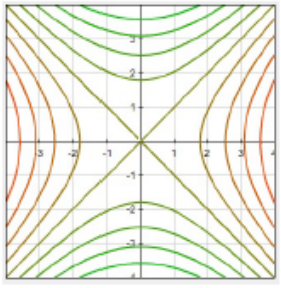
$$f(x,y) = x^2 - y^2$$

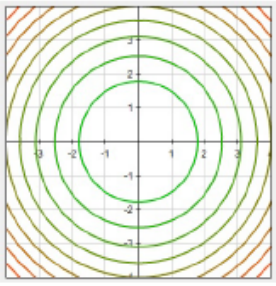
I. 

II. 

III. 

A. 

B. 

C. 

(a) I and B (b) I and A (c) II and A

(d) II and C (e) III and C

3. Evaluate the following limit

$$\lim_{(x,y)\to(0,0)} \frac{y + xe^{-y^2}}{1 + x^2}.$$

4. Show that the following limit does not exist

$$\lim_{(x,y)\to(0,0)} \frac{x^2 y}{x^4 + y^2}.$$

5. Find the second partial derivative g_{xy} of the function

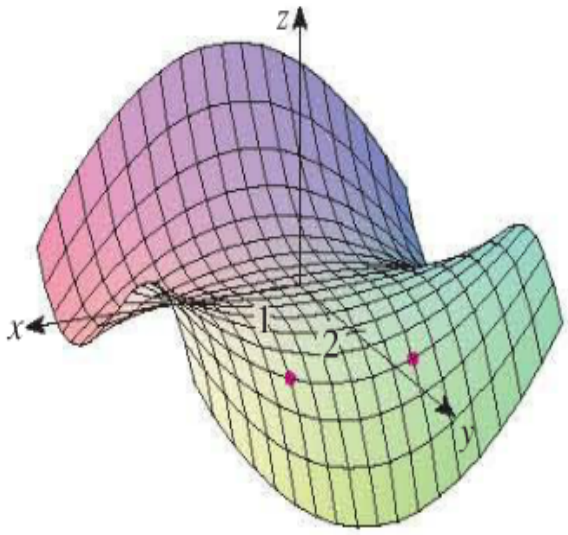
$$g(x, y) = x^3y^2 + e^{xy}.$$

6. Let $z = z(x, y)$ be defined implicitly as a function of x and y by the equation

$$x^2e^y = -z\cos(yz).$$

Find $\dfrac{\partial z}{\partial x}$ at the point $x = 1$, $y = 0$, and $z = -1$.

7. The graph of f is shown below



Determine the sign of

(a) $f_x(1, 2)$
(b) $f_y(1, 2)$
(c) $f_x(-1, 2)$
(d) $f_y(-1, 2)$

8. The paraboloid $z = 6 - x - x^2 - 2y^2$ intersects the plane $x = 1$ in a parabola. Use the geometry of partial derivative to find the **slope** for the tangent line to this parabola at the point $(1, 2, -4)$.