

Quiz #2

$$1.) \lim_{(x,y) \rightarrow (3,1)} \frac{xy - 3y - 3x + 9}{x-3} = \lim_{(x,y) \rightarrow (3,1)} \frac{y(x-3) - 3(x-3)}{(x-3)} = \lim_{(x,y) \rightarrow (3,1)} \frac{(x-3)(y-3)}{x-3}$$

$$= \lim_{(x,y) \rightarrow (3,1)} (y-3) = 1-3 = -2$$

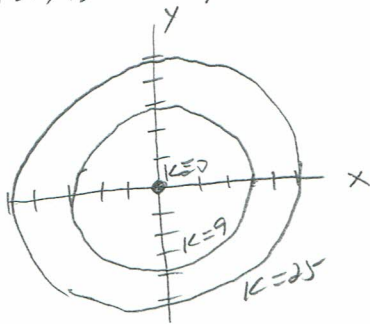
$$2.) \lim_{(x,y) \rightarrow (0,0)} \frac{x^b}{x^b - y^3}$$

x-axis: $\lim_{\substack{(x,y) \rightarrow (0,0) \\ y=0}} \frac{x^b}{x^b - y^3} = \lim_{\substack{(x,y) \rightarrow (0,0) \\ y=0}} \frac{x^b}{x^b} = 1$

y-axis: $\lim_{\substack{(x,y) \rightarrow (0,0) \\ x=0}} \frac{x^b}{x^b - y^3} = \lim_{\substack{(x,y) \rightarrow (0,0) \\ x=0}} \frac{0}{-y^3} = 0$

∴ by the two paths approach, since there are two different limits, the limit does not exist.

$$3.) f(x,y) = x^2 + y^2 \quad k=0, k=9, k=25$$



$$x^2 + y^2 = 0 \quad k=0$$

$$x^2 + y^2 = 9 \quad k=9$$

$$x^2 + y^2 = 25 \quad k=25$$

$$4.) f(x,y) = x e^{x^2 y^2}$$

$$a. f_x = e^{x^2 y^2} + x e^{x^2 y^2} 2xy^2 = e^{x^2 y^2} + 2x^2 y^2 e^{x^2 y^2}$$

$$b. f_y = x e^{x^2 y^2} 2xy = 2x^2 y e^{x^2 y^2}$$

$$c. f_{xx} = 2xy^2 e^{x^2 y^2} + 4xy^2 e^{x^2 y^2} + 2x^2 y^2 e^{x^2 y^2} 2xy^2 = 6xy^2 e^{x^2 y^2} + 4x^3 y^4 e^{x^2 y^2}$$

$$d. f_{yy} = 2x^3 e^{x^2 y^2} + 2x^3 y e^{x^2 y^2} 2xy = 2x^3 e^{x^2 y^2} + 4x^5 y e^{x^2 y^2}$$

$$e. f_{xy} = 2x^2 y e^{x^2 y^2} + 4x^2 y e^{x^2 y^2} + 2x^2 y e^{x^2 y^2} 2xy = 6x^2 y e^{x^2 y^2} + 4x^4 y^3 e^{x^2 y^2}$$

$$5. \quad w = x^3 + y^4 z^2, \quad x = 4t^3 + 6, \quad y = 5t^4 + 7, \quad z = 3t + 8$$

$$\frac{dw}{dt} = \frac{\partial w}{\partial x} \frac{dx}{dt} + \frac{\partial w}{\partial y} \frac{dy}{dt} + \frac{\partial w}{\partial z} \frac{dz}{dt}$$

$$\frac{dw}{dt} = 3x^2(12t^2) + 4y^3 z^2(20t^3) + 2y^4 z(3)$$

$$= 36x^2 t^2 + 80y^3 z^2 t^3 + 6y^4 z$$