

MA3160

Quiz 3 – Summer 2007

13<sup>th</sup> July 2007

Closed Book/Notes

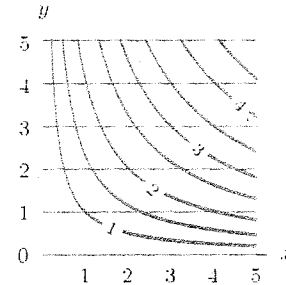
Name: Key

1.) The figure below is a contour diagram for  $z = f(x,y)$ . Answer the following questions, providing suitable justification.

2 a.) What is the sign of  $f_x$ ? As  $x \uparrow$   $f \uparrow$   
So  $f_x > 0$

2 b.) Estimate  $f_y(4,1)$ .

$$f_y(4,1) \approx \frac{3.5 - 2.0}{3 - 1} = 0.75$$



2.) Find the following partial derivatives.

2  $\frac{\partial u}{\partial E}$  if  $u = \frac{1}{2}\epsilon E^2 + \frac{1}{2\mu}B^2$  =  $\epsilon E$

$$\frac{\partial u}{\partial E} = 2\left(\frac{1}{2}\epsilon E\right) + 0 \quad \curvearrowright$$

2  $\frac{\partial z}{\partial y}$  if  $z = \underbrace{e^{(x+2y)}}_u \underbrace{\sin(y)}_v$  =  $\underbrace{2(e^{(x+2y)})}_u \underbrace{\sin(y)}_v + \underbrace{e^{(x+2y)}}_u \underbrace{\cos(y)}_v$   
=  $e^{(x+2y)} [2 \sin y + \cos y]$

3.) Find the local linearization of  $f(x,y) = x^2y$  at the point (3,1).

$$f_x = 2xy \quad f_y = x^2 \quad z_0 = 3^2(1) = 9$$

$$f_x(3,1) = 6 \quad f_y(3,1) = 9$$

2

$$z = z_0 + f_x(x-x_0) + f_y(y-y_0)$$

$$z = 6(x-3) + 9(y-1) + 9$$

$$= 6x - 18 + 9y - 9 + 9$$

$$\boxed{z = 6x + 9y - 18}$$