BIRZEIT UNIVERSITY
MATHEMATICS DEPARTMENT

Quiz 7 Math2311 Fall 2018/2019

Name.....**BZU#**.....**Section#**.....

1. Circle the correct answer

   (a) If the normal to $z = f(x, y)$ at $(2, 1)$ is $x = 2 + 2t,\ y = 1 - t,\ z = 1 - t$, then the linearaization of $f(x, y)$ at $(2, 1)$ is

   i. $L(x, y) = 2x - y - 1$
   ii. $L(x, y) = -2x + y + 1$
   iii. $L(x, y) = 2x - y - 2$
   iv. $L(x, y) = 2x - y + 2$
   v. None of the above

   (b) An estimate change of $f(x, y) = \ln\sqrt{x^2 + y^2}$ when the point at (3,4) is moved a distance $ds = 0.1$ away from the origin is

   i. $\frac{13}{250}$
   ii. $\frac{13}{1250}$
   iii. $\frac{13}{125}$
   iv. $\frac{130}{125}$
   v. None of the above

   (c) The parametric equations for the line tangent to the curve of intersection of the surfaces $x^2 + y^2 = 4$ and $x^2 + y^2 - z = 0$ at $(\sqrt{2}, \sqrt{2}, 4)$ is

   i. $x = \sqrt{2} + t,\ y = \sqrt{2} - t,\ z = 4$
   ii. $x = \sqrt{2} - t,\ y = \sqrt{2} + t,\ z = 4$
   iii. $x = \sqrt{2} + \sqrt{2}t,\ y = \sqrt{2} + \sqrt{2}t,\ z = 4$
   iv. $x = \sqrt{2} - \sqrt{2}t,\ y = \sqrt{2} - \sqrt{2}t,\ z = 4$
   v. None of the above

2. If $f(x, y) = 1 + y + x\cos(y)$, then find

   (a) The linearization of $f(x, y)$ at $(0, 0)$ $L(x,y) = f(x_0,y_0) + f_x(P_0)(x-x_0) + f_y(P_0)(y-y_0) + \cancel{f_z(P_0)(z-z_0)}$

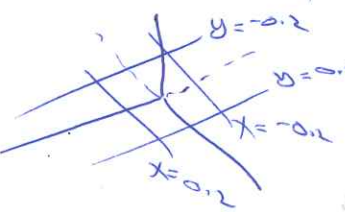
   $f(0,0) = 1+0+0 = 1$ $f_x = \cos y \Rightarrow f_x(0,0) = 1$ $f_y = 1 - x\sin(y) \Rightarrow f_y(0,0) = 1$

   $\therefore L(x,y) = 1 + 1(x-0) + 1(y-0)$

   $= 1 + x + y$

   (b) The maximum error in using $L(x, y)$ at $(0, 0)$ to approximate $f(x, y)$ over the region $|x| \le 0.2$ and $|y| \le 0.2$ $|E(x,y)| \le \frac{1}{2}M(0.2+0.2)^2$ $f_{xx} = 0$ $f_{xy} = -\sin(y)$

   $f_{yy} = -x\cos(y)$ $f_{yx} = -\sin(y)$

   but $M = 0.2 = |f_{yy}(0.2, 0)|$

   $\therefore |E(x,y)| \le \frac{1}{2}(0.2)(0.4)^2 = 0.1\,(0.16) = 0.016$

   is My Error