NAME: (print!) __Krithika Patrachari__   Section: __22__

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q19FirstLast.pdf) ASAP BUT NO LATER THAN Nov. 12, 8:00pm

1.

Determine whether or not the vector field

$$F(x, y, z) = y^2 z^3 \, \mathbf{i} + 2xyz^3 \, \mathbf{j} + 3xy^2 z^2 \, \mathbf{k}$$

is conservative. If it is conservative, find a function f such that $\mathbf{F} = \nabla f$.

$$\begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ \frac{d}{dx} & \frac{d}{dy} & \frac{d}{dz} \\ y^2z^3 & 2xyz^3 & 3xy^2z^2 \end{vmatrix} = \mathbf{i}\left(\frac{d}{dy} 3xy^2z^2 - \frac{d}{dz} 2xyz^3\right) - \mathbf{j}\left(\frac{d}{dx} 3xy^2z^2 - \frac{d}{dz} y^2z^3\right) + \mathbf{k}\left(\frac{d}{dx} 2xyz^3 - \frac{d}{dy} y^2z^3\right)$$

$$= \mathbf{i}(6xyz^2 - 6xyz^2) - \mathbf{j}(3y^2z^2 - 3y^2z^2) + \mathbf{k}(2yz^3 - 2yz^3) = \langle 0,0,0 \rangle$$

conservative

$\frac{\partial f}{\partial x} = y^2z^3$

$f = xy^2z^3 + g(y,z)$

$\frac{\partial}{\partial y}(xy^2z^3 + g(y,z)) = 2xyz^3$

$2xyz^3 + g'(y,z) = 2xyz^3$

$g'(y,z) = 0$

$f = xy^2z^3$

$\frac{\partial}{\partial z}(xy^2z^3) = 3xy^2z^2$

$3xy^2z^2 + h'(z) = 3xy^2z^2$

$h'(z) = 0$

$f = xy^2z^3$

2. Show that the line integral

$$\int_C 2xy^2 \, dx + 2x^2y \, dy \quad ,$$

is independent of the path C, and evaluate it if C is *any* path from $(1, 0)$ to $(0, 1)$.

$\frac{\partial f}{\partial x} = 2xy^2$

$f = 2y^2 + g(y)$

$\frac{\partial}{\partial y}(2y^2 + g(y)) = 2x^2y$

$4y + g'(y) = 2x^2y$

$g'(y) = 2x^2y - 4y$

$g(y) = x^2y^2 - 2y$

$f = 2y^2 + x^2 + y^2 - 2y$ **$f(1,0) = 1$**

$f(0,1) = 1$