NAME: (print!) ___Gillian Mulvay___ Section: _____

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: qXFirstLast.pdf) ASAP BUT NO LATER THAN Dec. 1, 2020, 8:00pm

1. Determine whether or not the vector field is conservative. If it is, find a function f such that $\mathbf{F} = \nabla f$.

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

$$F \times \nabla = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 3x^2y^3z^3+yz & 3x^3y^2z^3+xz & 3x^3y^3z^2+xy \end{vmatrix} = (9x^3y^2z^2+x - 9x^3y^2z^2+x)i - (9x^2y^3z^2+y - 9x^2y^3z^2+y)j + (9x^2y^2z^3+z - 9x^2y^2z^3+z)k$$

$$= 0i - 0j + 0k$$

$$\frac{df}{dx} = 3x^2y^3z^3+yz \qquad \frac{df}{dy} = 3x^3y^2z^3+xz \qquad \frac{df}{dz} = 3x^3y^3z^2+xy$$

$$f = x^3y^3z^3 + xyz + g(y,z) \qquad f = x^3y^3z^3 + xyz \qquad f = x^3y^3z^3 + xyz$$
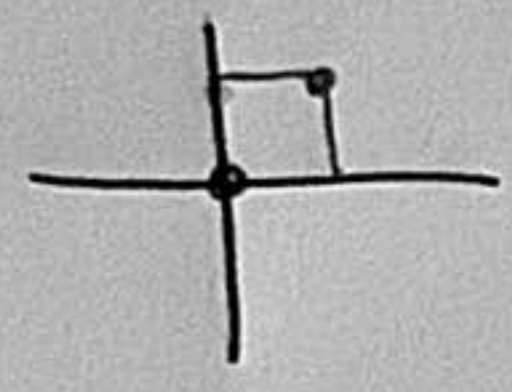
$$x^3y^3z^3 + xyz = x^3y^3z^2 + xyz + g(y,z)$$

$$g(y,z) = 0$$

$$f = 2x^3y^3z^3 + 2xyz$$

2. Evalute
$$\int_C 5y\,dx + 10x\,dy \quad,$$
where C is the closed curve consisting of the boundary of the rectangle $\{(x,y) \mid 0 \le x \le 1, \quad 0 \le y \le 1\}$.

$$\iint_0 \frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\, dA = \int_C P\,dx + Q\,dy$$

$$\iint 10 - 5\, dA$$

$$\int_0^1 \int_0^1 5\,dy\,dx = \int_0^1 5y\Big|_0^1\,dx = \int_0^1 5\,dx = 5x\Big|_0^1 = 5$$

or $\qquad 5 \cdot area = 5 \cdot 1 \cdot 1 = 5$