

"QUIZ" for Lecture 23

NAME: (print!) Orion Kress-Santilippo Section: 22

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 $F = \nabla f$.

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

$$\text{curl}(F) =$$

$$P = 3x^2y^3z^3 + yz$$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ 3x^2y^3z^3 + yz & 3x^3y^2z^3 + xz & 3x^3y^3z^2 + xy \end{vmatrix}$$

$$\int P dx = x^3 y^3 z^3 + xyz + C$$

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

$$= \left(\cancel{9x^3y^2z^2 + x} - \cancel{9x^3y^2z^2 + x} \right) \hat{i} - \left(\cancel{9x^2y^3z^2 + y} - \cancel{9x^2y^3z^2 + y} \right) \hat{j} + \left(\cancel{9x^2y^2z^3 + z} - \cancel{9x^2y^2z^3 + z} \right) \hat{k} = 0 \checkmark$$

2. Evaluate

$$\int_C 5y dx + 10x dy$$

where C is the closed curve consisting of the boundary of the rectangle

$$\{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq 1\}.$$

By Green's Thm:
(bc closed region) $= \iint \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dA$

$$= \int_0^1 \int_0^1 10 - 5 dx dy = \boxed{5}$$