

**“QUIZ” for Lecture 23**

**NAME:** (print!) LiuyangShan

**Section:** 24

**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  $\mathbf{F} = \nabla f$ .

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

$$\begin{array}{ccc} \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ \hline \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \end{array} = \begin{array}{l} 3x^2y^3z^3 + yz \quad 3x^3y^2z^3 + xz \quad 3x^3y^3z^2 + xy \\ (9x^3y^2z^2 + x - 9x^3y^2z^2 - x)\mathbf{i} - (9x^2y^3z^2 + y - 9x^2y^3z^2 - y)\mathbf{j} + (9x^2y^2z^3 + z - 9x^2y^2z^3 - z)\mathbf{k} = (0, 0, 0) \\ f = x^3y^3z^3 + xyz \end{array}$$

**2.** Evaluate

$$\oint_C 5y \, dx + 10x \, dy,$$

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

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

$$\int_0^1 \int_0^1 5 \, dx \, dy = 25$$