"QUIZ" for Lecture 19

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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

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

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

$\operatorname{curl} F(x,y,z) = [6xyz^2 - 6xyz^2]i + [3y^2z^2 - 3y^2z^2]j + [2yz^3 - 2yz^3]k$

$= 0 \Rightarrow$ Conservative

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

$2xyz^3 = 2xyz^3 + 0$

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

$f_z = 3xy^2z^2 + h'(x) \ldots$

all same.

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

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 $\overset{A}{(1,0)}$ to $\overset{B}{(0,1)}$.

$P = 2xy^2 \quad Q = 2x^2y$

$\frac{\partial P}{\partial y} = 4xy \quad \frac{\partial Q}{\partial x} = 4xy$

$\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x}$

Conservative & Independent

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

$= d(x^2y^2) = du$

$u = x^2y^2$

$\int 2xy^2dx + 2x^2y\,dy = u(B) - u(A)$

$(0^2 \cdot 1^2) - (1^2 \cdot 0^2) = \boxed{0}$