"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

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

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

$\text{curl}(F) = \langle 6xyz^2 - 6xyz^2,\ 3y^2z^2 - 3y^2z^2,\ 2yz^3 - 2yz^3 \rangle$

$= \langle 0, 0, 0 \rangle$

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

$2xyz^3 + g_y = 2xyz^3 \rightarrow g_y = 0,\quad g(y, z) = h(z)$

$3xy^2z^2 + h_z = 3xy^2z^2 \rightarrow h_z = 0$

$f = xy^2z^3$

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 $(0, 1)$.

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

$4xy = 4xy$

it's conservative, so it doesn't depend on C

$f = \int 2xy^2\, dx = x^2y^2 + g(y)$

$2x^2y + g_y = 2x^2y \quad g_y = 0$

$f(x, y) = x^2y^2$

$f(0, 1) - f(1, 0) = 0 - 0$

result: 0