

## "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

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

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

Handwritten solution for problem 1:

	$\frac{\partial}{\partial x}$	$\frac{\partial}{\partial y}$	$\frac{\partial}{\partial z}$
$\mathbf{i}$	$y^2 z^3$	$2xyz^3$	$3xy^2 z^2$
$\mathbf{j}$	$2xyz^3$	$2xyz^3$	$3xy^2 z^2$
$\mathbf{k}$	$3xy^2 z^2$	$3xy^2 z^2$	$3xy^2 z^2$

$C = i(6xyz^3 - 6xyz^3) - j(2yz^3 - 2yz^3) + k(2yz^3 - 2yz^3) = 0$   
~~the vector~~  $f_x = y^2 z^3$   
 $f = xy^2 z^3 + f(y, z)$   
 $f_y = 2xyz^3$   
 $f = xy^2 z^3 + f(z)$   
 $f_z = 3xy^2 z^2$   
 $f = xy^2 z^3$   
 The vector field is conservative and  $f = xy^2 z^3$ .

2. Show that the line integral

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

is independent of the path  $C$ , and evaluate it if  $C$  is any path from  $(1, 0)$  to  $(0, 1)$ .

Handwritten solution for problem 2:

$f_{xy} = 4xy$   
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 $f_x = 2xy^2 \quad f = x^2y^2 + f(y)$   
 $f_y = 2x^2y \quad f = x^2y^2$   
 $\int_C 2xy^2 dx + 2x^2y dy = x^2y^2 \Big|_{(1,0) \rightarrow (0,1)}$   
 $= 0 - 0$   
 $= 0$   
 The line integral is independent of the path  $C$  and is 0.