University of Connecticut
Department of Mathematics

MATH 2110Q PRACTICE EXAM 3 FALL 2016

NAME: _____

DISCUSSION SECTION: _____

Read This First!

- Read the questions and instructions carefully.
- The available points for each problem are given in brackets.
- You must **show your work** to obtain full credit (and to possibly receive partial credit). Correct answers with no justification will not receive credit.
- Make sure your answers are clearly indicated, and cross out any work you do not want graded.
- Do not leave any blanks! Even if you do not arrive at an answer, show as much progress towards a solution as you can, and explain your reasoning.
- Calculators are allowed, but models that can do symbolic computations (TI-89 and above, including TI-NSpire) are not allowed.

Grading - For Administrative Use Only

Page:	1	2	3	4	5	Total
Points:	11	8	11	12	8	50
Score:						

1. A particle moves along the curve given by $\vec{r}(t) = \langle \ln(t), (t+1)^2, 3-t \rangle$, $t > 0$.

   (a) Find $\vec{r}\,'(t)$. [3]

   (b) Find an equation of the tangent line at the point $(0, 4, 2)$. [4]

   (c) Set up an integral that represents the distance the particle travels from $t = 4$ to $t = 7$. [4]

2. Compute the line integral of $f(x, y) = 4xy$ over the line segment from $(1, -2)$ to $(3, 0)$. [8]

3. Let C be the curve given by the line segment from the origin to $(2, 0)$, followed by the portion of the circle going counterclockwise from $(2, 0)$ to $(0, -2)$, followed by the line segment from $(0, -2)$ back to the origin.

   (a) Sketch the curve C. Be sure to label the direction of motion. [3]

   (b) If $\vec{F} = \langle -2y, x \rangle$, evaluate the line integral of $\vec{F}$ over C. [4]

   (c) If $\vec{F} = \langle x^2 y, -xy^2 \rangle$, evaluate the line integral of $\vec{F}$ over C. [4]

4. Let $\vec{F} = \langle 3x^2 - 2xy + 5, y^3 - x^2 \rangle$ be a vector field.

   (a) Show that $\vec{F}$ is conservative. [4]

   (b) Determine a function $f(x, y)$ so that $\vec{F} = \vec{\nabla} f$. [4]

   (c) If C is the circle $(x - 2)^2 + (y + 4)^2 = 9$ traversed clockwise, evaluate the line integral [4]

$$\int_C \vec{F} \cdot d\vec{r}$$

5. Compute the work done by the force field $\vec{F} = \langle 2x, 3y^2, 4z^3 \rangle$ in moving a particle along the line segment from $(-2, 1, -1)$ to $(1, 1, 1)$ and then along a line segment back to the origin. [8]

   Hint: What is the gradient vector for $f(x, y, z) = x^2 + y^3 + z^4$?