University of Connecticut
Department of Mathematics

Math 2110Q — Practice Exam 1 — Fall 2017

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 not allowed.

Grading - For Administrative Use Only

Page:	1	2	3	4	5	Total
Points:	8	13	11	7	11	50
Score:						

1. Let $\vec{a} = \langle 5, -1, 2 \rangle$ and $\vec{b} = \langle 3, 1, 1 \rangle$. Find $\vec{a} \cdot (\vec{a} \times \vec{b})$ [3]

2. If the angle between two planes is defined as the angle between their normal vectors, find the cosine of the angle between the planes $x + y = 2$ and $x + y + \sqrt{2}z = \sqrt{6}$. [5]

3. Find and classify all critical points for the function $f(x, y) = \frac{1}{2}y^2 - \frac{1}{3}x^3 - xy + 2x + 5$ [8]

4. Find a vector equation for any one line that is parallel to the plane $3x - 5y + z = 10$. [5]

5. Let $f(x, y) = x^2(y^3 + 1)^2 + 3x$. Find an equation of the tangent plane at the point $(1, 1, 7)$. [5]

6. Let D be the region in the xy-plane enclosed by $y = x$, $y = -x$, and $x^2 + y^2 = 8$ with $x \geq 0$. Sketch D and set up a double integral in polar coordinates to compute the area of D. **Do not evaluate**. [6]

7. Consider the double integral $\int_0^5 \int_y^5 e^{x^2}\,dx\,dy$.

   (a) Sketch the region being integrated over. [2]

   (b) Evaluate the integral. [5]

8. Give equations and sketches for two different traces of the surface $x^2 + 4y^2 - z^2 = 0$. [4]

9. Let $f(x, y) = x^2 e^{xy}$

   (a) Find $D_{\vec{u}} f(2, 0)$ if $\vec{u}$ is the unit vector $\left\langle \frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right\rangle$. [4]

   (b) Find the direction in which the derivative of f at $(1, 1)$ is maximized, and find the value of the maximum derivative. [3]