University of Connecticut
Department of Mathematics

MATH 1131Q PRACTICE EXAM 3 SPRING 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 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	Total
Points:	12	15	8	15	50
Score:					

1. Let $f(x) = \sqrt{x} + 3x^2 + 2$

   (a) Approximate the area under the graph $y = f(x)$ over $[0, 3]$ using three subintervals and midpoints (M_3). **Round your answer to two decimal places**. [6]

   (b) Evaluate $\int_0^3 (\sqrt{x} + 3x^2 + 2)\, dx$ to find the exact area under $y = f(x)$ over $[0, 3]$. **Give an exact answer**. [6]

2. Find the absolute maximum and minimum values of $f(x) = x^2e^x$ over the interval $[-4, -1]$. [8]
Round your answers to three decimal places.

3. Find the intervals where $f(x) = x^4 - 4x^3 - 18x^2 + 10$ is concave up and concave down, and identify any points of inflection. [7]

4. We are constructing a cylindrical container with a lid. The surface area of the container must be 12 ft^2. Find the radius and height of the container that will maximize its volume. [8]

   Note: If a cylinder has radius r and height h, its total surface area (top, bottom, and sides) is $S = 2\pi r^2 + 2\pi rh$ and its volume is $V = \pi r^2 h$.

5. Evaluate the limit $\lim_{x \to 0} x \ln(x^2)$. [7]

6. Let $g(x) = \int_{-2}^{x} \sin(t^5 - t)\, dt$. Find $g'(x)$. [2]

7. Circle to indicate whether each statement is true or false, and **justify your answers**.

   (a) The most general antiderivative of $f(x) = e^{3x} - \sin x$ is $F(x) = \frac{1}{3}e^{3x} - \cos x + C$ [3]

   True **False**

   (b) If f is differentiable and $f(-1) = f(1)$, then there is a number c such that $|c| < 1$ and $f'(c) = 0$. [3]

   True **False**