MAC 2233, Fall 2018

Exam #4

November 27, 2017

Name _____

- You will be told when to begin the work and when to terminate work on the examination. You must stop when instructed. Points may be deducted in case of violations.
- Please show your work to support your answers that require calculations. Correct but unsupported answers may not be given full credit.
- The use of a cell phone or other electronic communication devices during the examination is not allowed. The exam will be canceled and a grade of "0" will be assigned to anyone who opens a cell phone during the examination or if one is found on their seat or hand.

No calculators are allowed!

1. (4 pts) Describe the relationship and differences between integration and differentiation.

2. (6 pts each) Find the indefinite integral.

   (a) $\int x^2 - 2 \, \mathrm{d}x$

   (b) $\int u^{1.1}(\frac{3}{u} - 1) \, \mathrm{d}u$

   (c) $\int \sqrt{x^3} - \frac{6}{x} + \sqrt{2} \, \mathrm{d}x$

3. (8 pts each) Find the indefinite integral

   (a) $\int e^{2x+3} \, \mathrm{d}x$

(b) $\int x^4 e^{2-x^5}\ \mathrm{d}x$

(c) $\int \frac{y^2}{(2y^3-10)^4}\ \mathrm{d}y$

4. (8 pts) Solve the given initial value problem for $y = f(x)$.

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{2}{x} - 4 + e^{2x} \quad \text{where } y = 0 \text{ when } x = 1$$

5. (8 pts each) Evaluate the integral and simplify your answer.

(a) $\int_1^3 x + 2 \, \mathrm{d}x$

(b) $\int_2^3 \frac{x}{x-1} \, \mathrm{d}x$

(c) $\displaystyle\int_e^{e^2} \frac{1}{x \ln x} \, \mathrm{d}x$

6. (10 pts) The marginal profit of a certain commodity is $P'(q) = 100 - 2q$ when q units are produced. When 10 units are produced, the profit is \$700. [You can leave your answer in calculator ready form. No simplification is necessary.]

   (a) Find the profit function $P(q)$

   (b) What level of production q maximizes the profit?

7. (8 pts) Use the information below to evaluate the integrals:

$$\int_1^5 f(x)\,\mathrm{d}x = 3, \quad \int_3^5 f(x)\,\mathrm{d}x = -2, \quad \int_1^5 g(x)\,\mathrm{d}x = -1$$

   (a) $\int_1^5 4f(x) - g(x)\,\mathrm{d}x$

   (b) $\int_1^3 f(x)\,\mathrm{d}x$

8. (8 pts) Find the function $f(x)$ given the information below

$$f'(x) = \frac{x+2}{x^2+4x+5}, \quad f(-1) = 3$$