Exam #4

April 19, 2019

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) We learned that the derivative of $\ln(x)$ is $\frac{1}{x}$. Does this information help us to find the integral of $\ln(x)$? If yes, then explain why/how and if no, then explain what we can imply from this information.

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

   (a) $\int 1 + x^2 \, dx$

   (b) $\int e^{3t}(e^t - 2) \, dt$

   (c) $\int \frac{\sqrt{x} - x^3 + 1}{x} \, dx$

3. (8 pts each) Find the indefinite integral

   (a) $\int x\sqrt{5x^2 - 3} \, dx$

(b) $\int xe^{x^2-1} \, dx$

(c) $\int \frac{2\ln(x)}{x} \, dx$

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

$$\frac{dy}{dx} = \frac{2}{x} - \frac{1}{x^2} \quad \text{where } y = -1 \text{ when } x = 1$$

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

(a) $\int_0^1 \sqrt{u} \, du$

(b) $\int_1^3 \frac{x-3}{(x^2-6x)^2} \, dx$

(c) $\int_0^2 (2x-3)^3 \, dx$

6. (8 pts) A manufacturer estimates that the marginal cost of producing q units of a certain commodity is $C'(q) = 3q^2 - 12q + 12$ dollars per unit. If the cost of producing 1 unit is \$20, what is the cost of producing 5 units? [You can leave your answer in calculator ready form. No simplification is necessary.]

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

$$\int_1^5 f(x) \, dx = 3, \quad \int_3^5 f(x) \, dx = -2, \quad \int_1^5 g(x) \, dx = -1$$

(a) $\int_1^5 2f(x) - g(x) \, dx$

(b) $\int_1^3 f(x) \, dx$

8. (4 pts) Determine if the following statement is true or false. Support your answer.

(true / false)

$$\int \frac{x^2}{x-1} \, dx = \frac{\frac{1}{3}x^3}{\frac{1}{2}x^2 - x} + C$$

9. (4s pts) Verify that $\int \ln(x) \, dx = x \ln(x) - x + C$

Use this page if you need additional space.