Sols

Math 122 Calculus for Business Admin. and Social Sciences

Exam #3 A
November 20, 2017

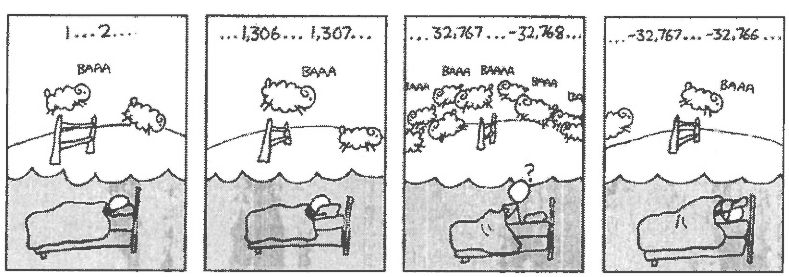
Instructor: Ann Clifton

Name: ______________________________

Do not turn this page until told to do so. You will have a total of 50 minutes to complete the exam. Unless otherwise stated, you **must** show all work to receive full credit. Unsupported or otherwise mysterious answers will **not receive credit.** If you require extra space, use the provided scrap paper and indicate that you have done so.
You may use a calculator **without a CAS** if you like, but a calculator is not necessary. NO PHONES ALLOWED.
Draw a turkey on this page if you read these directions in full. Cheating of any kind on the exam will not be tolerated and will result in a grade of 0%.

#	score	out of	#	score	out of
1		4	9		6
2		4	10		12
3		4	11		16
4		4	12		16
5		4	13		12
6		6	EC		5
7		6			
8		6	Total		100

Remember: This exam has no impact on your worth as a human being. You got this!!!



Fill in the blanks.

1. (4 points) If $f(x)$ is a continuous function on the interval $[a, b]$ and $F(x)$ is any antiderivative of $f(x)$, then

$$\int_a^b f(x)dx = F(b) - F(a)$$

2. (4 points) Let $n \neq -1$ be a fixed number,

3 1

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C$$

3. (4 points)

3 1

$$\int \frac{1}{x} dx = \ln|x| + C$$

4. (4 points) Let k be any non-zero constant,

3 1

$$\int e^{kx} dx = \frac{e^{kx}}{k} + C$$

5. (4 points) Let a be a positive constant,

3 1

$$\int a^x dx = \frac{a^x}{\ln(a)} + C$$

Multiple Choice. Choose the best answer. (6 points each.)

6 6. Find the antiderivative $F(x)$ of the function $f(x) = 3x^2 + e^x$ which satisfies $F(0) = 2$.

B

A. $F(x) = x^3 + e^x + 2$ **B.** $F(x) = x^3 + e^x + 1$

C. $F(x) = x^3 + e^x + c$ **D.** $F(x) = x^3 + e^x + 3$

6 7. Find the definite integral $\int_1^4 \left(\frac{3}{x} + \frac{1}{\sqrt{x}}\right) dx$. Round your answer to three decimal places.

D

A. -6.159 **B.** 8.826

C. -8.826 **D.** 6.159

6 8. Find the definite integral $\int_2^7 \left(\frac{1}{x} - \frac{2}{x^3}\right) dx$. Round your answer to three decimal places.

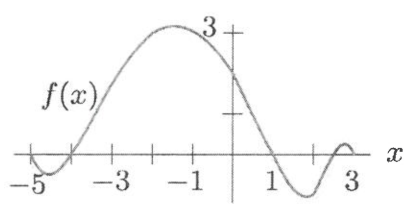
A

A. 1.023 **B.** 0.334

C. -1.023 **D.** 1.482

6 9. Using the graph below, determine whether $\int_{-5}^{1} f(x)dx$ is positive, negative, approximately zero, or if there is not enough information.

A



A. Positive **B.** Negative

C. Approximately Zero **D.** Not enough information

Short Answer.

10. (12 points) Approximate the area under the curve $y = x^2$ on the interval $[0, 4]$ using $n = 4$ right-endpoint subintervals.

$\Delta t = \frac{4-0}{4} = 1$ 6 $0, 1, 2, 3, 4$

$1\left((1)^2 + (2)^2 + (3)^2 + (4)^2\right)$

6 $1 + 4 + 9 + 16$

$\boxed{30}$

11. (16 points) Compute the following indefinite integrals.

5 (a) $\int (10x + 2)dx$

$5x^2 + 2x + C$

5 (b) $\int (36x^2 + 26x)dx$

$12x^3 + 13x^2 + C$

6 (c) $\int \frac{1}{\sqrt{x}}dx = \int x^{-1/2} dx$

$= 2x^{1/2} + C$

12. (16 points) Compute the following indefinite integrals.

5 (a) $\int (x+2)e^{\frac{1}{2}x^2+2x+1}dx$

$u = \frac{1}{2}x^2 + 2x + 1$

$du = (x+2)\,dx$

3

$\int e^u du = e^u + C$

$= e^{\frac{1}{2}x^2+2x+1} + C$

1 1

5 (b) $\int \frac{4x}{2x^2+7}dx$

$u = 2x^2 + 7$

$du = 4x\,dx$

3

$\int \frac{1}{u} du = \ln|u| + C$

$= \ln|2x^2+7| + C$

3 1 1

6 (c) $\int \frac{x}{\sqrt{x^2+1}}dx$

$u = x^2 + 1$

3

$du = 2x\,dx$

$\frac{1}{2} du = x\,dx$

1

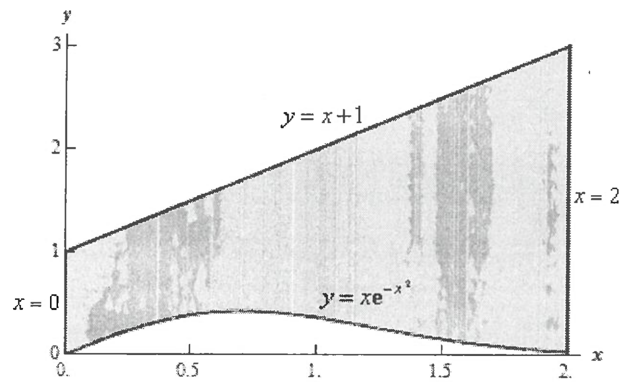
$\frac{1}{2}\int \frac{1}{\sqrt{u}} du$

$= \frac{1}{2} \cdot 2u^{1/2} + C$

$= (x^2+1)^{1/2} + C$

1 1

13. (12 points) Find the area of the region bounded by $y = xe^{-x^2}$ and $y = x + 1$ on the interval $[0, 2]$. *Set up but do* **not** *evaluate the integral.* The graph of the region is given below for reference.



$$\int_0^2 (x+1) - (xe^{-x^2})\,dx$$

3

3

6

Extra Credit. 5 points Evaluate the integral from the previous problem (the problem above). Give an **exact** answer; ie, compute the integral by hand without a calculator.

$$\int_0^2 (x+1)\,dx - \int_0^2 xe^{-x^2}\,dx \qquad u = -x^2, \quad u(2) = -4, \quad u(0) = 0, \quad du = -2x\,dx$$

$$= \frac{x^2}{2} + x \Big|_0^2 + \frac{1}{2}\int_0^{-4} e^u\,du$$

8

$$= \left(\frac{2^2}{2} + 2\right) - \left(\frac{0^2}{2} + 0\right) + \frac{1}{2}\left[e^{-4} - e^0\right]$$

$$= 2 + 2 + \frac{1}{2}(e^{-4} - 1)$$

$$= 4 + \frac{1}{2}e^{-4} - \frac{1}{2} = \frac{7}{2} + \frac{1}{2}e^{-4}$$

6

2