

Name: \_\_\_\_\_

Answer the questions on the exam and not on a separate sheet of paper. No work is necessary for the True/False questions. For all other questions, please circle your answers and show your work for full credit. There are 10 questions for a total of 100 points.

**True or False: Please circle either true or false. No work is necessary.**

\_\_\_\_\_ 1. (5 points)  $\lim_{n \rightarrow \infty} \sum_{i=0}^n x_i^2 \Delta x = \frac{1}{3}$  where  $\{x_i\}$  is a partition of the interval  $[0, 1]$  for each  $n$ .  
A. True    B. False

\_\_\_\_\_ 2. (5 points) If  $\int_1^5 f(x)dx = 12$  and  $\int_4^5 f(x)dx = 4$ , then  $\int_1^4 f(x)dx = 16$ .  
A. True    B. False

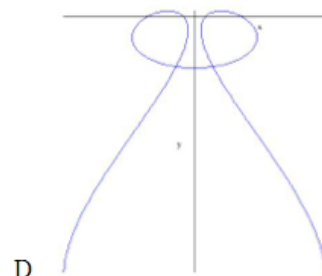
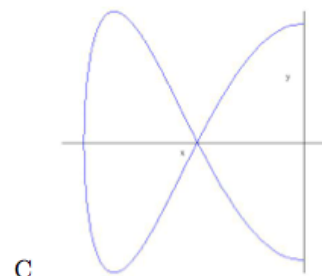
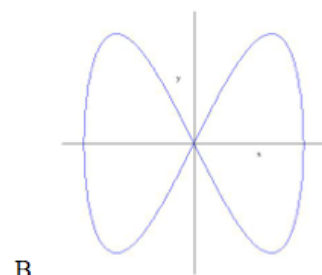
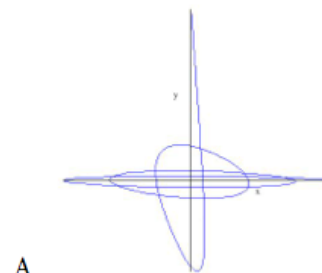
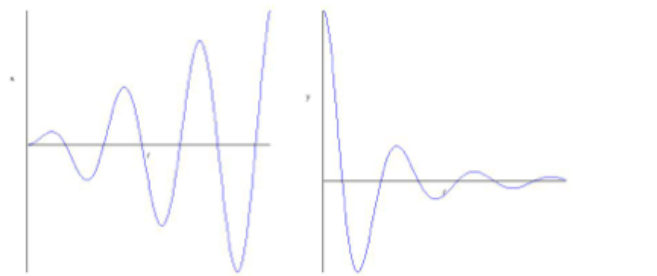
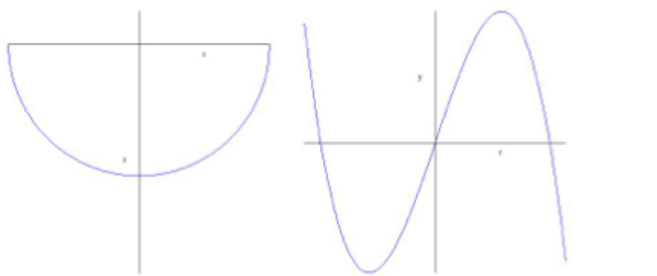
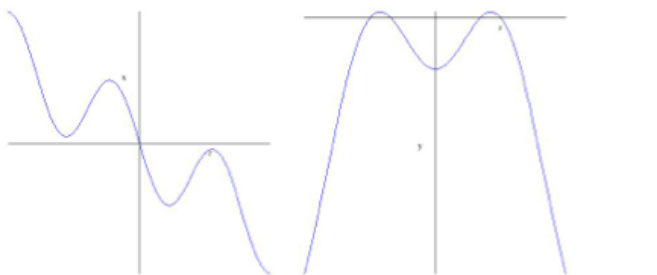
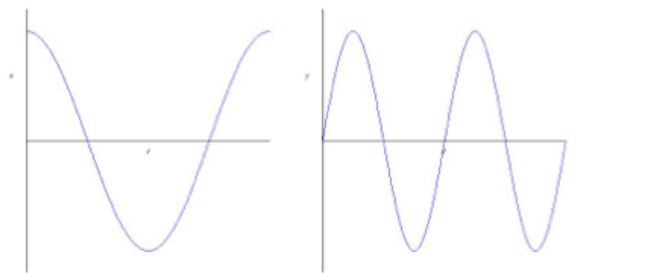
\_\_\_\_\_ 3. (5 points)  $\int_{-1}^1 t(1-t)^2 dt = 0$ .  
A. True    B. False

\_\_\_\_\_ 4. (5 points)  $\int e^{5x} dx = \frac{1}{5}e^{5x} + C$ .  
A. True    B. False

\_\_\_\_\_ 5. (5 points)  $\int \frac{1}{x} dx = -\frac{1}{x^2} + C$ .  
A. True    B. False

**Matching.** For each question match **exactly one** item one group with **exactly one** item from the other group.

6. (15 points) Match the graphs of the parametric equations  $x = f(t)$  and  $y = g(t)$  on the left with the parametric curves on the right.



**Short Answer.** Make sure and justify your answer for full credit.

7. (20 points) Let  $f$  be a function with the following conditions.

(1)  $f$  is differentiable on  $[a, b]$ ;

(2)  $f'$  is continuous on  $[a, b]$ ;

(3)  $f(a) = f(b) = 0$ ;

(4)  $\int_a^b f^2(x)dx = 1$ .

Show that  $\int_a^b xf(x)f'(x)dx = -\frac{1}{2}$ .

8. (10 points) Let  $f$  be a continuous function on  $[a, b]$ . Explain why the function  $f$  has an anti-derivative on  $[a, b]$ .

9. (15 points) Find the area enclosed by the curve  $x = t^2 - 2t$ ,  $y = \sqrt{t}$ , and the  $y$ -axis.

10. (15 points) Find the volume of the solid obtained by rotating about the  $x$ -axis the region under the curve  $y = \sqrt{x}$  from 0 to 1. Give the exact answer and do not approximate.