

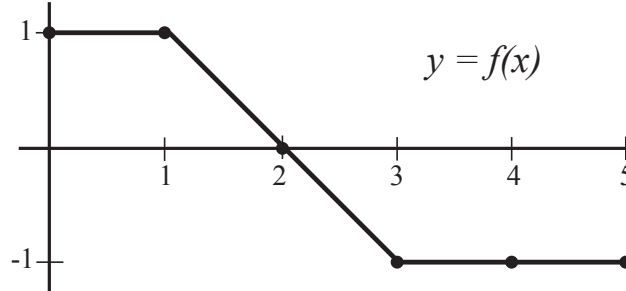


University of California, San Diego
Department of Mathematics

Instructions

1. Write your *Name, PID, Section, and Exam Version* on the front of your Blue Book.
2. No calculators or other electronic devices are allowed during this exam.
3. You may use one page of notes, but no books or other assistance during this exam.
4. Read each question carefully, and answer each question completely.
5. Write your solutions clearly in your Blue Book.
 - (a) Carefully indicate the number and letter of each question and question part.
 - (b) Present your answers in the same order they appear in the exam.
 - (c) Start each problem on a new page.
6. Show all of your work. No credit will be given for unsupported answers, even if correct.
7. Turn in your exam paper with your Blue Book.

0. (1 point) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.
1. (6 points) The graph of $y = f(x)$ appears below.



If $F'(x) = f(x)$ for all x and $F(0) = 2$, then find all values of x for which $F(x) = 3$.

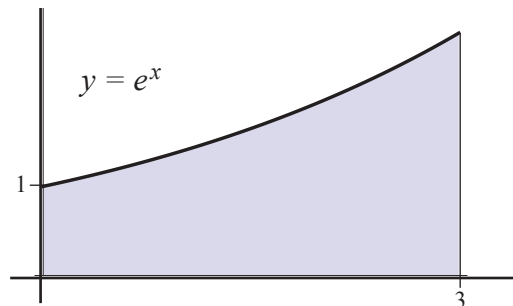
2. (6 points) Suppose f and g are continuous functions.
 - (a) If f is an odd function such that $\int_0^4 f(x) dx = 10$ and $\int_0^5 f(x) dx = 19$, then evaluate $\int_{-4}^5 f(x) dx$.
 - (b) If g is an even function such that $\int_0^4 g(x) dx = 10$ and $\int_0^5 g(x) dx = 19$, then evaluate $\int_{-4}^5 g(x) dx$.
3. (10 points) Use the Method of Partial Fractions to evaluate the integral: $\int \frac{2x+1}{(x+1)^2} dx$
4. (10 points) Evaluate the indefinite integral: $\int x^2 \sin x dx$

5. (a) (5 points) Evaluate the following improper integral: $\int_1^2 \frac{1}{\sqrt{2-x}} dx$
- (b) (5 points) Use the Comparison Test to determine if the improper integral converges or diverges.

$$\int_1^{\infty} \frac{|\cos x|}{x^2 + 1} dx$$

Clearly indicate the function you use for the comparison.

6. The shaded region in the graph is the region in the first quadrant bounded by $y = e^x$ and $x = 3$.



- (a) (5 points) Set up (**but do not evaluate**) an integral that gives the volume of the solid of revolution obtained by rotating the shaded region about the x -axis.
- (b) (5 points) Set up (**but do not evaluate**) an integral that gives the arclength of $y = e^x$ from $x = 0$ to $x = 3$.
- (c) (5 points) Set up (**but do not evaluate**) an integral that gives the area of the shaded region.
7. (6 points) Find an **explicit** solution $y = f(t)$ to the initial value problem:

$$\begin{cases} \frac{dy}{dt} = -3y^2 \cos t \\ y(0) = 2 \end{cases}$$

8. (6 points) Determine if the geometric series converges or diverges:

$$\sum_{n=1}^{\infty} \left(\frac{11}{3}\right)^{-n}$$

If it converges, find the sum to which it converges.