San Francisco Bay University

MATH202 - Calculus-II

Homework Assignment #2

Due Date: 2/25/2025

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1. If *f* is continuous on ℝ (real number), prove that

For the case where *f(x)≥0*, draw a diagram to interpret this equation geometrically as an equality of areas.

**Steps:**

1. **Substitution:** Let u = x + c. Then, du=dx.
2. **Change of Limits:** When x=a, u=a + c. When x=b, u=b+c.
3. **Rewrite the Integral:**

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1. **Conclusion:** Since u is just a dummy variable, we can replace u with x:

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1. **Geometric Interpretation:** For f(x)≥0*f*(*x*)≥0, the integral represents the area under the curve. Shifting the function f(x)*f*(*x*) by c*c* units horizontally shifts the area accordingly, but the total area remains the same.

**Solution:** A graph of a line

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**(2)  
 Find the following integral results and verify your answers in Python programs and Monte Carlo simulation methods.**

**a. -**  Solution:

These integrals are complex and may not have simple closed-form solutions. We will use numerical methods to evaluate them. This are the result of “Task A and B” in Python program method

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**b. And This is the Monte Carlo simulation method of both task:A screenshot of a computer program

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**Task (3)**

A solid is obtained by rotating the shaded region about the specified line (x-axis or y-axis). Find the volume of the solid and verify your answers in Python programs.

a. About the y-axis

b. About the x-axis

**Solution:**

The volume of a solid of revolution can be found using the disk/washer method.

For rotation about the y-axis:

Chart

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For rotation about the x-axis:

Chart

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And The solution for rotation about the y-axis and x-axis with result:

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**Task (4):**

Find the present value *P* of a continuous income flow of *c(t)* dollars per year using

where is the time in years and *r* is the annual interest rate compounded continuously

**Solution:**

For part a:

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For part b:

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And the result code is:

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**Task (5):**

The crescent-shaped region bounded by two circles forms a lune. Find the area of the lune given that the radius of the smaller circle is 3 and the radius of the larger circle is 5 using Monte Carlo simulation methods.

Diagram, venn diagram

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**Task (6):** A screenshot of a math problem

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