

Math 126
Fall 2025
Dr. Lily Yen

Test 2
Show all your work

Full Name: _____
Student Number: _____
Signature: _____
Score: ____/41

No Calculator permitted in this part. Read the questions carefully. Show all your work and clearly indicate your final answer. Use proper notation.

Problem 1: Evaluate the following integrals analytically.

a. $\int t^3 \ln(t) \, dt$

Score: /3

b. $\int x \tan^{-1}(x) \, dx$

Score: /3

Problem 2: Determine analytically the convergence of the following integral.

$$\int_1^\infty \frac{\cos(x) + 2}{\sqrt{x}} \, dx$$

Score: /3

Problem 3: Evaluate if possible, otherwise state why the integral does not exist.

$$\int_0^5 \frac{1}{\sqrt[3]{x-3}} dx$$

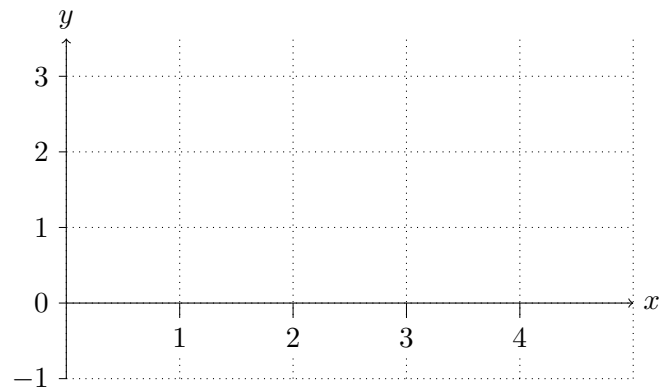
Score: /4

Problem 4: Find the indefinite integral: $\int e^{-x} \cos(2x) dx$.

Score: /4

Calculators permitted from here on.

Problem 5: Draw $y_1 = \frac{1-x}{x}$ and $y_2 = \ln(x)$ on the grid. Shade the region bounded by these two graphs and the line $x = 3$.



Use integrals to express the following. DO NOT EVALUATE YOUR INTEGRALS. Draw a cross-sectional strip for each solid.

- a. The area of the region enclosed by y_1 , y_2 , and $x = 3$.

Score: /2

- b. The volume of a solid that has the shaded region as its base, and cross-sections perpendicular to the x -axis are squares .

Score: /2

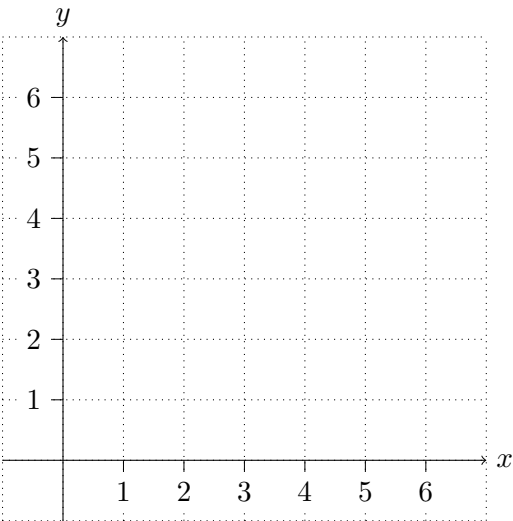
- c. The volume of the solid obtained by rotating the region around $x = -1$.

Score: /2

- d. The volume of the solid obtained by rotating the region around $y = 2$.

Score: /2

Problem 6: Consider the region bounded by the y -axis, $x + y = 6$, and $y = x^2$ in the first quadrant. Draw the region and set up the expression for the perimeter of the region. All straight line segments in the perimeter must be computed exactly as a number or square root; only the curved border may be expressed as a definite integral. DO NO EVALUATE.



Score: /4

Problem 7: Use the method of partial fractions to integrate the following.

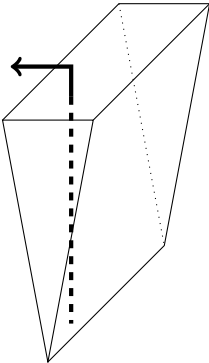
$$\int \frac{3x - 2}{(2x - 5)(x + 1)} dx$$

Score: /4

Problem 8: A spring has a natural length of 0.8 m. A force of 24 N stretches the spring to a total length of 2 m. Find the work required to stretch the spring 1.5 m beyond its natural length.

Score: /3

Problem 9: A tank in the shape of a triangular prism of length 10 m whose vertical cross sections are isosceles triangles of height 8 m and base 3 m is buried 1 m below ground and filled with a fluid of density 200 kg/m^3 . Find the work required to pump all the fluid out of the tank from a valve at ground level.



Score: /5