St. Joseph's University
Date: March 9, 2026 Professor: Asher Roberts

Calculus II Optional Take-Home Test 2

Number of questions—5 out of 6

Directions: Solve 5 out of 6 problems. Clearly indicate which problems you solve. If you solve more than 5 problems, only the first 5 problems will be scored.

Solve each of the following problems using separate paper, while clearly indicating each problem number when solving. Irrelevant work will detract from your score, while answers without work shown will be awarded no credit. Answers with partially correct work will receive partial credit. Each problem is worth 20 points. You must work alone, but you may use a graphing calculator as a supplement to your own work if you indicate the steps used. You may not use a phone, computer, computational intelligence, AI, or other tools to assist you in solving the problems.

1. Find the volume of the solid obtained by rotating the region bounded by the curves $y = x^3$, $y = 0$, and $x = 1$ about the line $x = 2$.
2. Evaluate $\displaystyle\int (1 + x^2)e^{3x}\,dx$.
3. Evaluate $\displaystyle\int_0^{\pi/4} \sec^6\theta \tan^6\theta\,d\theta$.
4. Evaluate $\displaystyle\int \frac{x}{\sqrt{x^2 - 1}}\,dx$.
5. Evaluate $\displaystyle\int \frac{3x^2 - x + 8}{x^3 + 4x}\,dx$.
6. Evaluate $\displaystyle\int_0^{\infty} e^{-\sqrt{x}}\,dx$.