

You have 20 minutes to complete this quiz which is worth 20 points. Calculators are permitted, but no other aids are allowed. Show all work neatly and in order, and clearly indicate your final answers. Answers must be justified whenever possible in order to earn full credit. When you do use your calculator, sketch all relevant graphs and write down all relevant mathematics.

Part A: Concepts

1. (3 points) State the Fundamental Theorem of Calculus.

2. (2 points) True or False: The reason the “Fundamental Theorem of Calculus” is so important is because it allows us to compute the true area under *any* curve. In fact, this is how we define the definite integral.

3. (2 points) True or False: $\int_0^1 x^3 dx = \frac{1}{4}x^4 + C$.

4. (2 points) True or False: $\int \ln x dx = x \ln x - x + C$.

Part B: Calculations

5. (6 points) Compute the following integrals:

a. (3 pts) $\int \frac{1}{x^2} dx$

b. (3 pts) $\int_0^{\frac{\pi}{4}} \sin x dx$

6. (2 points) Evaluate $\int_7^{13} \sin^2 x dx + \int_7^{13} \cos^2 x dx$.
(Hint: Use an identity.)

7. (3 points) Recall that the length of the curve $f(x)$ from $x = a$ to $x = b$ is $\int_a^b \sqrt{1 + (f'(x))^2} dx$.

Write an integral that expresses the length of the curve $f(x) = \sqrt{1 + 2x}$ from $x = -1$ to $x = 1$. Simplify your answer.