

Calculators, mobile phones, and pagers are not allowed during this exam

1. Evaluate the following integrals:

{5 × 3 pts}

a. $\int \sqrt{6x - x^2} - 8 dx$

b. $\int \cot^3 x \csc^3 x dx$

c. $\int \frac{x^2 - 4}{x^2 + 1} dx$

d. $\int \frac{dx}{e^x + e^{2x}}$

e. $\int \frac{1}{x^2} \cos^{-1} \frac{1}{x} dx$

2. Determine whether the following integral converges or diverges, and if it converges, find its value:

{4 pts}

$$\int_0^{\infty} e^{-\sqrt{x}} dx$$

3. Given a plane curve C with parametrization:

{3 × 2 pts}

$$x = \cos t + t \sin t, \quad y = \sin t - t \cos t, \quad 0 \leq t \leq 2\pi$$

a. Find the values of the parameter t at which the curve has vertical tangent lines.

b. Find the second derivative $\frac{d^2y}{dx^2}$.

c. Find the length of C .