

First Name: \_\_\_\_\_ Last Name: \_\_\_\_\_

Student-No: \_\_\_\_\_ Section: \_\_\_\_\_

Grade:
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## Indefinite Integrals

1. 9 marks Each part is worth 3 marks. Please write your answers in the boxes.

(a) Calculate the indefinite integral  $\int e^{-2x} \sqrt{1 + 2e^{-2x}} dx$ .

Answer:

(b) Calculate the indefinite integral  $\int (x + 1)e^{-x} dx$  for  $x > 0$ .

Answer:

(c) (A Little Harder): Calculate the indefinite integral  $\int \tan^5(x) \sec^3(x) dx$ .

Answer:

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## Definite Integrals

2. 12 marks Each part is worth 4 marks. Please write your answers in the boxes.

(a) Calculate  $I = \int_0^{\pi/8} \sin^2(2x) dx$ .

Answer:

(b) Calculate  $I = \int_1^e x^2 \ln x dx$ .

Answer:

(c) (A Little Harder): Calculate  $I = \int_0^{\infty} e^{-x} \sin(x) dx$ .

Answer:

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## Riemann Sum, FTC, and Volumes

3. 12 marks Each part is worth 4 marks. Please write your answers in the boxes.

(a) Calculate the infinite sum

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{2i}{n^2} e^{-4i^2/n^2}$$

by first writing it as a definite integral. Then, evaluate this integral.

Answer:

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(b) For  $x > 0$  define  $F(x) = \int_1^x t^{-1/2} dt$  and  $g(x) = \sqrt{F(x^2)}$ . Calculate  $g'(2)$ .

Answer:

- (c) Write a definite integral, with specified limits of integration, for the volume obtained by revolving the bounded region between  $x = (y - 2)^2$  and  $x = 2 - (y - 2)^2$  about the vertical line  $x = -2$ . **Do not evaluate the integral.**

Answer:

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4. (a) 4 marks Write a definite integral with specific limits of integration that determines the finite area enclosed by  $y^2 = 4 - x$  and  $x = 3y - 6$ .

- (b) 2 marks Evaluate the integral and so compute the area enclosed.

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5. A solid has as its base the region in the  $xy$ -plane between  $y = 1 - x^2/36$  and the  $x$ -axis. The cross-sections of the solid perpendicular to the  $x$ -axis have a square shape.

(a) 4 marks Write a definite integral that determines the volume of the solid.

(b) 2 marks Evaluate the integral to find the volume of the solid.

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