

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  $\int \frac{3x}{x+4} dx$ .

Answer:

(b) Calculate the indefinite integral  $\int \arctan(x) dx$ .

Answer:

(c) (A Little Harder): Calculate the indefinite integral  $\int \frac{1}{x\sqrt{x^2-1}} dx$  for  $x > 1$ .

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  $\int_0^{\pi/4} \tan^2(x) dx$

Answer:

(b) Calculate  $\int_{-\pi}^{\pi} (1 + x^3) \cos^2(x) dx$ .

Answer:

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

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

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{6i}{n^2} \sqrt{1 + \frac{4i^2}{n^2}}$$

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

Answer:

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(b) Define  $F(x)$  and  $g(x)$  by  $F(x) = \int_0^x \cos^2(t) dt$  and  $g(x) = x F(x^2)$ . Calculate  $g'(\sqrt{\pi})$ .

Answer:

- (c) Write a definite integral, with specified limits of integration, for the volume obtained by revolving the bounded region between  $y = x^2$  and  $y = 9x$  about the horizontal line  $y = -2$ . **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  $y^2 = 10 - x$  and  $x = (y - 2)^2$ .

- (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  $y = 1 - x^2/16$  and the  $x$ -axis. The cross-sections of the solid perpendicular to the  $x$ -axis are semi-circles with the diameter of the semi-circle in the base.

(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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