

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 $I = \int x^2 e^{-3x^3} dx$.

Answer:

(b) Calculate the indefinite integral $I = \int \frac{3x-2}{x^2+6x+8} dx$ for $x > 0$.

Answer:

(c) (A Little Harder): Calculate the indefinite integral $\int x^2 \sin x \, dx$.

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 $I = \int_0^{\pi/8} \tan^5(2x) \sec^2(2x) dx$.

Answer:

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

Answer:

(c) (A Little Harder): Calculate $I = \int_0^1 x^3 \sqrt{1-x^2} dx$.

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

$$\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{1}{n(4 + i^2/n^2)}$$

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 $g(x) = \sqrt{F(x^4)}$. Calculate $g'(2)$.

Answer:

- (c) Write a definite integral, with specified limits of integration, for the volume obtained by revolving the bounded region between $x = 2(y - 2)^2$ and $x = 6 - (y - 2)^2$ 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 $y^2 = 2x$ and $y = x - 4$.

- (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 $y = 1 - x^2/49$ 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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