

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 $\int x^2\sqrt{8-x^3} dx$ for $x < 2$.

Answer:

(b) Calculate the indefinite integral $\int x\sqrt{x-1} dx$ for $x > 1$.

Answer:

(c) (A Little Harder): Calculate the indefinite integral $\int \ln(1 + x^2) dx$.

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 $\int_0^\pi \sin^3(x) dx$.

Answer:

(b) Calculate $\int_{-1}^1 (x^2 e^{-x^3} + x^5 \cos(x)) dx$.

Answer:

(c) (A Little Harder): Calculate $\int_1^e (\ln x)^2 dx$.

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

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

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 $F(x) = \int_1^x \ln t \, dt$ and $g(x) = x F(x^2)$ for $x > 1$. Calculate $g'(e)$.

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 $y = 6x - 5$ 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 $y^2 = 6 + x$ and $2y = x - 2$.

- (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 isosceles right triangles (i.e. $45 - 45 - 90$ triangles) with the longest side (i.e. the hypotenuse) 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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