2015 Fall Math 2B (44352)   Quiz 3 (10/23)

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible. No notes, phones and calculators. You have 30 minutes to take this 10 point quiz.

Please also put your name in the back of the quiz.

Student Name:   Student ID:

1. (3 pts) Evaluate the indefinite integral.

\[ \int x \ln(3x) \, dx \]

\[ \int x \ln(3x) \, dx = \frac{1}{2} x^2 \ln(3x) - \frac{1}{2} \int x \, dx = \frac{1}{2} x^2 \ln(3x) - \frac{1}{4} x^2 + C \]

2. (3 pts) Evaluate the definite integral

\[ \int_0^1 (x^2 + 3) e^{-x} \, dx \]

\[ \int_0^1 (x^2 + 3) e^{-x} \, dx = \left. (-x^2 + 3) e^{-x} \right|_0^1 + 2 \int_0^1 x e^{-x} \, dx \]

\[ \quad = \left. (-\frac{4}{e} + 3) + 2 \left[ (-x e^{-x}) \right]_0^1 + \int_0^1 e^{-x} \, dx \right] \]

\[ \quad = -\frac{4}{e} + 3 + 2 \left[ -\frac{1}{e} - \frac{1}{e} + 1 \right] \]

\[ \quad = 5 - \frac{8}{e} \]
3. (2 pts) Evaluate the indefinite integral

\[ \int \sin \theta \cos^2 \theta d\theta \]

Let \( u = \cos \theta \), \( du = -\sin \theta \, d\theta \)

\[ \int \sin \theta \cos^2 \theta \, d\theta = -\int u^2 \, du = -\frac{1}{3} u^3 + C \]

Let \( u = \cos \theta \), \( du = -\sin \theta \, d\theta \)

\[ \int \sin \theta \cos^2 \theta \, d\theta = -\frac{1}{3} \cos^3 \theta + C \]

\[ \int \frac{x}{x^2 - 1} \, dx = \ln |x^2 - 1| = \ln |\ln |x^2 - 1|| \]

4. (2 pts) Evaluate the definite integral

\[ \int_{0}^{\frac{\pi}{2}} (2\sin^2 x - 1) \, dx \]

\[ \int_{0}^{\frac{\pi}{2}} (2\sin^2 x - 1) \, dx = \int_{0}^{\frac{\pi}{2}} (-\cos 2x) \, dx \]

\[ \left. \left( -\frac{1}{2} \sin 2x \right) \right|_{0}^{\frac{\pi}{2}} = 0 - 0 = 0 \]

\[ \left. \left( -\frac{1}{2} \sin 2x \right) \right|_{0}^{\frac{\pi}{2}} = \frac{\pi}{2} \]