

Last name:

First name:

Student no.:

This test has two parts, the first part has 4 multiple choices questions (5 marks each) and the second part has 1 long answer of 10 marks. Calculator is NOT allowed

A1 What is $\int \tan 2x \, dx$?

- (a) $\frac{1}{2} \ln |\sec 2x| + C$ (b) $\ln |\sec 2x| + C$ (c) $2 \ln |\cos 2x| + C$ (d) $\frac{1}{2} \ln \sqrt{\csc 2x} + C$ (e) None

Ans (a)

A2 What is $\int \tan^3 x \, dx$?

- (a) $\frac{1}{3} \tan^3 x + \ln |\sec x| + C$ (b) $\frac{1}{2} \ln |\sec x - \tan^2 x| + C$ (c) $\frac{1}{2} \tan^2 x - \ln |\sec x| + C$
 (d) $2 \ln |\sec x + \tan^2 x| + C$ (e) None

Ans (c)

A3 Which of the following substitutions is true for $\int \sqrt{9 + 8x - x^2} \, dx$?

- (a) $x = 4 + 5 \sin \theta$ (b) $x = 4 + 5 \tan \theta$ (c) $x = 4 - 2 \sin \theta$ (d) $x = 3 + 4 \sec \theta$ (e) None

Ans (a)

A4 Which of the following is an appropriate decomposition, using partial fractions for $\int \frac{x - 2}{x^2(x^2 + 1)(x + 3)} \, dx$?

- a) $\frac{A}{x} + \frac{B}{x^2 + 1} + \frac{C}{x + 3}$ b) $\frac{A}{x} + \frac{Bx + C}{x^2 + 1} + \frac{D}{x + 3}$
 c) $\frac{A}{x} + \frac{B}{x^2} + \frac{Cx + D}{x^2 + 1} + \frac{E}{x + 3}$ d) $\frac{A}{x^2} + \frac{Bx + C}{x^2 + 1} + \frac{D}{x + 3}$ e) : None

Ans (c)

B1:[5 marks]- Evaluate $A = \int_{-\infty}^{+\infty} e^{|2x|} \, dx$.

Solution:

$$\begin{aligned} \int_{-\infty}^{+\infty} e^{|2x|} \, dx &= \int_{-\infty}^0 e^{-2x} \, dx + \int_0^{+\infty} e^{2x} \, dx \\ &= \int_{-\infty}^0 e^{-2x} \, dx + \int_0^{+\infty} e^{2x} \, dx \\ &= \lim_{t \rightarrow -\infty} \left[-\frac{1}{2} e^{-2x} \right]_t^0 + \lim_{s \rightarrow +\infty} \left[\frac{1}{2} e^{2x} \right]_0^s \\ &= \infty + \infty = \infty \end{aligned}$$