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Quiz 5

This quiz is graded out of 10 marks. No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(3 marks)* §5.5 #46 Evaluate the definite integral.

$\int_{-\pi/2}^{\pi/2} \frac{x^2 \sin x}{1+x^6}\,dx$ Let $f(x) = \frac{x^2 \sin x}{1+x^6}$

$f(-x) = \frac{(-x)^2 \sin(-x)}{1+(-x)^6} = \frac{x^2(-\sin x)}{1+x^6}$ since $\sin x$ is odd

$= -\frac{x^2 \sin x}{1+x^6} = -f(x)$ $\therefore f(x)$ is odd

$\therefore \int_{-\frac{\pi}{2}}^{\pi/2} \frac{x^2 \sin x}{1+x^6}\,dx = 0$

Question 2. *(3 marks)* §5.5 #14 Evaluate the indefinite integral.

$\int \frac{dt}{\cos^2 t \sqrt{1+\tan t}} = \int \frac{\sec^2 t}{\sqrt{1+\tan t}}\,dt = \int \frac{1}{\sqrt{u}}\,du$

$u = 1+\tan t$
$du = \sec^2 t\,dt$

$= \int u^{-1/2}\,du$

$= 2\sqrt{u} + C$

$= 2\sqrt{1+\tan t} + C$

Question 3. *(4 marks)* §5.5 #51

$\int_e^{e^4} \frac{dx}{x\sqrt{\ln x}} = \int_1^4 \frac{1}{\sqrt{u}}\,du = \left[2\sqrt{u}\right]_1^4$

$u = \ln x$
$du = \frac{1}{x}\,dx$
$u(e^4) = \ln e^4 = 4$
$u(e) = \ln e = 1$

$= 2\sqrt{4} - 2\sqrt{1}$

$= 4 - 2$

$= 2$