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Quiz 6

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. *(5 marks)* §6.2 #29 Evaluate the integral.

$$\int_{\pi/6}^{\pi/2} \cot^2 x \, dx = \int_{\pi/6}^{\pi/2} \csc^2 x - 1 \, dx = \left[-\cot x - x \right]_{\pi/6}^{\pi/2}$$

$$= \left[-\cot \frac{\pi}{2} - \frac{\pi}{2} \right] - \left[-\cot \frac{\pi}{6} - \frac{\pi}{6} \right]$$

$$= \left[-0 - \frac{\pi}{2} \right] - \left[-\sqrt{3} - \frac{\pi}{6} \right]$$

$$= \sqrt{3} - \frac{2\pi}{6}$$

$$= \sqrt{3} - \frac{\pi}{3}$$

Question 2. *(5 marks)* §6.2 #45 Evaluate the integral.

$$\int \frac{1}{\sqrt{x^2 + 16}} \, dx = \int \frac{1}{\sqrt{(4\tan\theta)^2 + 16}} \, 4\sec^2\theta \, d\theta$$

$$x = 4\tan\theta$$
$$dx = 4\sec^2\theta \, d\theta \qquad = \int \frac{4\sec^2\theta}{\sqrt{16\tan^2\theta + 16}} \, d\theta$$

$$\frac{opp}{adj} = \frac{x}{4} = \tan\theta \qquad = \int \frac{4\sec^2\theta}{\sqrt{16(\tan^2\theta + 1)}} \, d\theta$$

$$= \int \frac{4\sec^2\theta}{\sqrt{16\sec^2\theta}} \, d\theta$$

$$\therefore \ \sec\theta = \frac{hyp.}{adj.} = \frac{\sqrt{x^2+16}}{4} \qquad = \int \sec\theta \, d\theta$$

$$= \ln|\sec\theta + \tan\theta| + C$$

$$= \ln\left| \frac{\sqrt{x^2+16}}{4} + \frac{x}{4} \right| + C$$