

Quiz 2

Name: Key

Give your answer in terms of π . Show all your steps.

$$\int_{-1}^{\infty} \frac{5}{x^2 + 6x + 13} dx$$

$$\begin{aligned} x^2 + 6x + 13 &= x^2 + 6x + \left(\frac{6}{2}\right)^2 + 13 - (3)^2 \\ &= (x+3)^2 + 13 - 9 \\ &= (x+3)^2 + 4 \end{aligned}$$

$$\rightarrow \int_{-1}^{\infty} \frac{5}{(x+3)^2 + 4} dx = 5 \int_{-1}^{\infty} \frac{1}{(x+3)^2 + 4} dx$$

$$= 5 \cdot \frac{1}{2} \arctan\left(\frac{x+3}{2}\right) \Big|_{-1}^{\infty}$$

$$= \frac{5}{2} \arctan\left(\frac{x+3}{2}\right) \Big|_{-1}^{\infty}$$

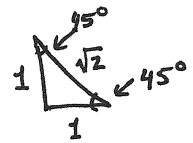
$$= \frac{5}{2} \arctan(\infty) - \frac{5}{2} \arctan\left(\frac{-1+3}{2}\right)$$

$$= \frac{5}{2} \cdot \frac{\pi}{2} - \frac{5}{2} \arctan(1)$$

$$= \frac{5\pi}{4} - \frac{5}{2} \cdot \frac{\pi}{4}$$

$$= \frac{5\pi}{4} - \frac{5\pi}{8}$$

$$= \frac{5\pi}{8}$$



$$\begin{aligned} \text{So } \tan 45^\circ &= 1 \\ \Rightarrow \tan^{-1}(1) &= 45^\circ \end{aligned}$$

$$45^\circ = \frac{\pi}{4}$$

Set up the partial fractions for the integral. Do not calculate the integral.

$$\int \frac{11x^9 + 4x^8 - 2x^6 - 2x^5 + x^2 + 29x - 13}{x^3(5-x)(2x+1)(4x^2+1)(x^2+x+1)(x-3)^2} dx$$

$$= \int \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x^3} + \frac{D}{5-x} + \frac{E}{2x+1} + \frac{Fx+G}{4x^2+1} + \frac{Hx+I}{x^2+x+1} + \frac{J}{x-3} + \frac{K}{(x-3)^2} dx$$