

STEP II, 2001, Q6

6 Show that

$$\int_0^1 \frac{x^4}{1+x^2} dx = \frac{\pi}{4} - \frac{2}{3}.$$

Determine the values of

(i) $\int_0^1 x^3 \tan^{-1} \left(\frac{1-x}{1+x} \right) dx,$

(ii) $\int_0^1 \frac{(1-y)^3}{(1+y)^5} \tan^{-1} y dy.$



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