

# Math 2315 - Calculus 2

Quiz #3 - 2017.01.12

Solutions

---

Compute the following integral:  $\int \frac{w^3}{1+w^8} dw$

We first note that  $w^8 = (w^4)^2$ , thus

$$\int \frac{w^3}{1+w^8} dw = \int \frac{w^3}{1+(w^4)^2} dw$$

Furthermore since the numerator has a  $w^3$ , which is almost the derivative of  $w^4$ , we perform the substitution  $u = w^4$ , with  $du = 4w^3 dw$ . Thus

$$\begin{aligned} \int \frac{w^3}{1+w^8} dw &= \int \frac{w^3}{1+(w^4)^2} dw \\ &= \frac{1}{4} \int \frac{1}{1+u^2} du \\ &= \frac{1}{4} \tan^{-1}(u) + \mathcal{C} \\ &= \frac{1}{4} \tan^{-1}(w^4) + \mathcal{C} \end{aligned}$$