

4.5 u-Substitution with Definite Integrals

1) $\int_0^{\pi/4} \tan x \sec^2 x \, dx$

$$u = \tan x$$
$$du = \sec^2 x \, dx$$

$$u(0) = \tan 0 = 0$$

$$u\left(\frac{\pi}{4}\right) = \tan \frac{\pi}{4} = 1$$

3) $\int_0^1 u \, du = \frac{u^2}{2} \Big|_0^1$

$$= \frac{1}{2}$$

2) $\int_{-1}^1 3x^2 \sqrt{x^3+1} \, dx$

$$u = x^3 + 1$$
$$du = 3x^2 \, dx$$

$$u(-1) = (-1)^3 + 1 = 0$$

$$u(1) = 2$$

4) $\int_0^2 u^{1/2} \, du = \frac{2}{3} u^{3/2} \Big|_0^2$

$$= \frac{2}{3} \sqrt{2^3} = \frac{2}{3} \cdot \sqrt{8} = \frac{2}{3} \cdot 2\sqrt{2} = \frac{4\sqrt{2}}{3}$$

~~6)~~ $\int \left(\frac{t^3}{3} + \frac{1}{4t^2}\right) dt = \frac{1}{3} \cdot \frac{t^4}{4} + \frac{1}{4} \cdot \frac{t^{-1}}{-1} = \frac{1}{12} t^4 - \frac{1}{4} t^{-1} + C$

No u-sub!