$$\int x^4 \sin(x^5+2)\,dx$$

Let $u = x^5+2$

$du = 5x^4\,dx$

$dx = \frac{1}{5x^4}\,du$

$$\int \sin u \, x^4 \, \frac{1}{5x^4}\,du$$

$$\int \frac{1}{5}\sin u\,du$$

$$\frac{1}{5}\int \sin u\,du$$

$$\frac{1}{5}\int 5x^4 \sin(x^5+2)\,dx$$

$$\frac{1}{5}(-\cos u) + C$$

$$\frac{1}{5}\int \sin(\underbrace{x^5+2}_{u})\,\underbrace{5x^4\,dx}_{du}$$

$$\frac{-\cos(x^5+2)}{5} + C$$

$$\int_0^{\frac{\pi}{4}} \tan x \sec^2 x \, dx$$

Let $u = \tan x$

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

$u = \tan 0$

$u = 0$

$u = \tan \frac{\pi}{4}$

$u = 1$

$$\int_0^1 u \, du$$

$$\frac{u^2}{2} \Big|_0^1 = \frac{1}{2}$$

1

$$\int \tan x \, dx$$

Let $u = \cos x$

$du = -\sin x \, dx$

$$\int \frac{\sin x}{\cos x} \, dx$$

$$-\int -\frac{1}{u} \sin x \, dx$$

$$-\int \frac{1}{u} \, du$$

$$-\ln u + C$$

$$-\ln|\cos x| + C$$

$$\frac{dy}{dx} = (y+5)(x+2)$$

$$\int \frac{1}{y+5}\frac{dy}{dx}\,dx = \int x+2\,dx$$

$$\int \frac{1}{y+5}\,dy = \int x+2\,dx$$

$$\ln|y+5| = \frac{x^2}{2}+2x+C$$

$$e^{\ln|y+5|} = e^{\frac{x^2}{2}+2x+C}$$

$$|y+5| = e^{\frac{x^2}{2}+2x+C}$$

$$y = e^{\frac{x^2}{2}+2x+C} - 5$$

$\int \frac{1}{u}\,du$

$\ln|u| + C$

$\log_a b = k$

$a^k = b$