WHAT IS u?

1. $(u)^{\text{POWER}}$
2. $\sqrt{u}$
3. $\frac{\text{SOMETHING}}{u}$

1. $\int 4x^3 \sqrt{x^4+2}\, dx$

$u = x^4+2 \quad \frac{du}{dx} = 4x^3$

$dx\left(\frac{du}{dx}\right) = (4x^3)\, dx$

$du = 4x^3\, dx$

$= \int \sqrt{u}\, du$

$= \int u^{\frac{1}{2}}\, du$

$= \frac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C$

$= \frac{u^{\frac{3}{2}}}{\frac{3}{2}} + C$

$= \frac{2}{3}u^{\frac{3}{2}} + C$

$= \frac{2}{3}(x^4+2)^{\frac{3}{2}} + C$

2. $\int \frac{\cos x}{\sin^4 x}\, dx$

$= \int \frac{\cos x}{(\sin x)^4}\, dx$

$u = \sin x \quad du = \cos x\, dx$

$= \int \frac{1}{u^4}\, du$

$\int u^{-4}\, du$

$= \frac{u^{-4+1}}{-4+1} + C$

$= \frac{u^{-3}}{-3} + C$

$= \frac{1}{-3u^3} + C$

$= \frac{1}{-3\sin^3 x} + C$

3. $\int (x^3-2)^4 (3x^2)\, dx$

$u = x^3-2 \quad du = 3x^2\, dx$

$= \int u^4\, du$

$= \frac{u^{4+1}}{4+1} + C$

$= \frac{u^5}{5} + C$

$= \frac{1}{5}u^5 + C$

$= \frac{1}{5}(x^3-2)^5 + C$