When do you use u-substitution to solve an integration problem?

You use u-substitution to get rid of
1) composite functions
2) multiplication
3) division

Ex $\int (2x+3)^5 dx$
$u = 2x+3$
$du = 2\,dx$
$\frac{1}{2}\int u^5$

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

Ex $\int \frac{\cos x}{\sin x}\,dx$
$u = \sin x$
$du = \cos x\,dx$
$\int \frac{1}{u}\,du$

$$\int \frac{e^x}{\sqrt{e^x+1}}\,dx$$

$\int \frac{e^x}{\sqrt{e^x+1}}\,dx$ ☑ Pick your u (normally on inside of another function)

$\int \frac{du}{\sqrt{u}}$ $u = e^x+1$ ☑ take derivative

$\int \frac{1}{u^{1/2}}\,du$ $du = e^x\,dx$ ☑ Rewrite integral so completely in terms of u

$\int u^{-1/2}\,du$ ☑ Rewrite so can integrate

$\frac{2}{1}\cdot u^{1/2} + C$ ☑ Integrate

$2\sqrt{e^x+1} + C$ ☑ Rewrite in terms of x again.

$$\int x \sec^2(x^2)\,dx$$

$\frac{1}{2}\int 2x \sec^2(x^2)\,dx$ $u = x^2$ ☑ Pick u

$\frac{1}{2}\int \sec^2 u$ $du = 2x\,dx$ ☑ Take derivative.

☑ Need 2x dx so "force 2" on inside & put ½ on outside

$\frac{1}{2}\tan u + C$ ☑ take Integral

$\frac{1}{2}\tan(x^2) + C$ ☑ Rewrite in terms of x again