1) $\int x e^x \, dx$ $\quad uv - \int v\,du$

$u = x \qquad du = 1\,dx$

$dv = e^x \qquad v = e^x$

$x \cdot e^x - \int e^x \cdot 1 \, dx \qquad \int e^x = e^x$

$xe^x - e^x$ or $e^x(x-1)$

2) $\int x^2 \ln|x|\, dx$

ln, arc___ must be the "u".

$u = \ln|x| \qquad du = \frac{1}{x}dx$

$dv = x^2 \qquad v = \frac{x^3}{3}$

$$\frac{x^3}{3}\cdot\ln|x| - \int \frac{x^3}{3}\cdot\frac{1}{x}\,dx$$

$$\frac{x^3}{3}\ln|x| - \int \frac{x^2}{3}\,dx$$

$$\frac{x^3}{3}\ln|x| - \frac{1}{3}\int x^2\,dx$$

$$\frac{x^3}{3}\ln|x| - \frac{1}{3}\cdot\frac{x^3}{3} = \frac{x^3}{3}\ln|x| - \frac{x^3}{9} + C$$

3) $\int \arcsin x \, dx$

$u = \arcsin x \qquad du = \frac{1}{\sqrt{1-x^2}}$

$dv = dx \qquad v = x$

$x \cdot \arcsin x - \underbrace{\int \frac{x}{\sqrt{1-x^2}} \, dx}_{u \text{ substitution}}$

$u = 1 - x^2$

$du = -2x$

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

$2u^{\frac{1}{2}}$

$-u^{\frac{1}{2}}$

$+\sqrt{1-x^2}$

$x \arcsin x + \sqrt{1-x^2} + C$

4) $\int x^2 \sin x \, dx$

$u = x^2 \quad du = 2x$

$dv = \sin x \, dx \quad v = -\cos x$

$-x^2 \cos x - \int -\cos x \cdot 2x \, dx$

$-x^2 \cos x + 2 \int x \cos x \, dx$

Integration by parts again.

$u = x \quad du = 1$

$dv = \cos x \, dx \quad v = \sin x$

$-x^2 \cos x + 2 \left[x \sin x - \int \cos x \, dx \right]$

$-x^2 \cos x + 2 \left[x \sin x - \sin x \right]$

$-x^2 \cos x + 2x \sin x - 2 \sin x + C$

$$5) \int x \csc x \cot x \, dx$$

$u = x \qquad du = 1$

$dv = \csc x \cot x \, dx \qquad v = -\csc x$

$$-x \csc x - \int (-\csc x) \, dx$$

$$-x \csc x + \int \csc x \, dx$$

$$-x \csc x + (-\ln|\csc x + \cot x| + C)$$

$$-x \csc x - \ln|\csc x + \cot x| + C$$