6. $u = x,\ dv = \cos 2x\,dx,\ du = dx,\ v = \frac{1}{2}\sin 2x;$

$$\int x\cos 2x\,dx = \frac{1}{2}x\sin 2x - \frac{1}{2}\int \sin 2x\,dx = \frac{1}{2}x\sin 2x + \frac{1}{4}\cos 2x + C$$

7. $u = x^2,\ dv = \cos x\,dx,\ du = 2x\,dx,\ v = \sin x;\ \int x^2\cos x\,dx = x^2\sin x - 2\int x\sin x\,dx$

For $\int x\sin x\,dx$ use $u = x,\ dv = \sin x\,dx$ to get

$\int x\sin x\,dx = -x\cos x + \sin x + C_1$ so $\int x^2\cos x\,dx = x^2\sin x + 2x\cos x - 2\sin x + C$

8. $u = x^2,\ dv = \sin x\,dx,\ du = 2x\,dx,\ v = -\cos x;$

$\int x^2\sin x\,dx = -x^2\cos x + 2\int x\cos x\,dx$; for $\int x\cos x\,dx$ use $u = x,\ dv = \cos x\,dx$ to get

$\int x\cos x\,dx = x\sin x + \cos x + C_1$ so $\int x^2\sin x\,dx = -x^2\cos x + 2x\sin x + 2\cos x + C$

9. $u = \ln x,\ dv = x\,dx,\ du = \frac{1}{x}dx,\ v = \frac{1}{2}x^2;\ \int x\ln x\,dx = \frac{1}{2}x^2\ln x - \frac{1}{2}\int x\,dx = \frac{1}{2}x^2\ln x - \frac{1}{4}x^2 + C$

10. $u = \ln x,\ dv = \sqrt{x}\,dx,\ du = \frac{1}{x}dx,\ v = \frac{2}{3}x^{3/2};$

$$\int \sqrt{x}\ln x\,dx = \frac{2}{3}x^{3/2}\ln x - \frac{2}{3}\int x^{1/2}dx = \frac{2}{3}x^{3/2}\ln x - \frac{4}{9}x^{3/2} + C$$

11. $u = (\ln x)^2,\ dv = dx,\ du = 2\frac{\ln x}{x}dx,\ v = x;\ \int (\ln x)^2dx = x(\ln x)^2 - 2\int \ln x\,dx.$

Use $u = \ln x,\ dv = dx$ to get $\int \ln x\,dx = x\ln x - \int dx = x\ln x - x + C_1$ so

$$\int (\ln x)^2dx = x(\ln x)^2 - 2x\ln x + 2x + C$$

12. $u = \ln x,\ dv = \frac{1}{\sqrt{x}}dx,\ du = \frac{1}{x}dx,\ v = 2\sqrt{x};\ \int \frac{\ln x}{\sqrt{x}}dx = 2\sqrt{x}\ln x - 2\int \frac{1}{\sqrt{x}}dx = 2\sqrt{x}\ln x - 4\sqrt{x} + C$

13. $u = \ln(3x-2),\ dv = dx,\ du = \frac{3}{3x-2}dx,\ v = x;\ \int \ln(3x-2)dx = x\ln(3x-2) - \int \frac{3x}{3x-2}dx$

but $\int \frac{3x}{3x-2}dx = \int \left(1 + \frac{2}{3x-2}\right)dx = x + \frac{2}{3}\ln(3x-2) + C_1$ so

$$\int \ln(3x-2)dx = x\ln(3x-2) - x - \frac{2}{3}\ln(3x-2) + C$$

14. $u = \ln(x^2+4),\ dv = dx,\ du = \frac{2x}{x^2+4}dx,\ v = x;\ \int \ln(x^2+4)dx = x\ln(x^2+4) - 2\int \frac{x^2}{x^2+4}dx$

but $\int \frac{x^2}{x^2+4}dx = \int \left(1 - \frac{4}{x^2+4}\right)dx = x - 2\tan^{-1}\frac{x}{2} + C_1$ so

$$\int \ln(x^2+4)dx = x\ln(x^2+4) - 2x + 4\tan^{-1}\frac{x}{2} + C$$