- 8.1 #5-45 odd — basic integration techniques
- 8.2 #1-29 odd — integration by parts

$$\int u\,dv = uv - \int v\,du$$

28. $\int x\sin x\,dx = -x\cos x - \int -\cos x\,dx$

$u = x \qquad dv = \sin x\,dx$

$du = dx \qquad v = -\cos x$

$= -x\cos x + \int \cos x\,dx$

$= \boxed{-x\cos x + \sin x + C}$

36. $\int e^x \cos 2x\,dx$

$u = e^x \qquad dv = \cos 2x\,dx$

$du = e^x dx \qquad v = \frac{1}{2}\sin 2x$

$= \frac{1}{2}e^x \sin 2x - \int \frac{1}{2}e^x \sin 2x\,dx$

$u = \frac{1}{2}e^x \qquad dv = \sin 2x\,dx$

$du = \frac{1}{2}e^x dx \qquad v = -\frac{1}{2}\cos 2x$

$= \frac{1}{2}e^x \sin 2x - \left(-\frac{1}{4}e^x \cos 2x - \int -\frac{1}{4}e^x \cos 2x\,dx\right)$

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

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

$\frac{4}{5}\cdot\left(\frac{5}{4}\int e^x \cos 2x\,dx\right) = \left(\frac{1}{2}e^x \sin 2x + \frac{1}{4}e^x \cos 2x\right)\frac{4}{5}$

$\int e^x \cos 2x\,dx = \boxed{\frac{2}{5}e^x \sin 2x + \frac{1}{5}e^x \cos 2x + C}$

7.2

8. $\int \ln 3x\,dx = x\ln 3x - \int x \cdot \frac{dx}{x}$

$u = \ln 3x \qquad dv = dx$

$du = \frac{1}{3x}\cdot 3\,dx \qquad v = x$

$= \frac{dx}{x}$

$= x\ln 3x - \int dx$

$= \boxed{x\ln 3x - x + C}$

14. $\displaystyle\int \frac{e^{1/t}}{t^2}\,dt = \int -e^u\,du$

$u = \frac{1}{t}$

$du = -\frac{1}{t^2}\,dt$

$-du = \frac{dt}{t^2}$

$= -e^u + C$

$= \boxed{-e^{1/t} + C}$

48. $\displaystyle\int_0^1 x^2 e^x\,dx = x^2 e^x\Big|_0^1 - \int_0^1 2x e^x\,dx$

$u = x^2$ $dv = e^x\,dx$

$du = 2x\,dx$ $v = e^x$

$u = 2x$ $dv = e^x\,dx$

$du = 2\,dx$ $v = e^x$

$= x^2 e^x - \left(2xe^x - \int 2e^x\,dx\right)\Big|_0^1$

$= x^2 e^x - 2xe^x + 2e^x\Big|_0^1$

$= \left(e - \cancel{2e} + \cancel{2e}\right) - (0 - 0 + 2) = \boxed{e - 2}$