6.3

17) $\int e^x \sin x \, dx$

$u = \sin x \qquad v = e^x$

$du = \cos x \, dx \quad dv = e^x \, dx$

$\int e^x \sin x \, dx = e^x \sin x - \int e^x \cos x \, dx$

$u = \cos x \qquad v = e^x$

$du = -\sin x \, dx \quad dv = e^x \, dx$

$\int e^x \sin x \, dx = e^x \sin x - \left(e^x \cos x - \int -e^x \sin x \, dx\right)$

$\int e^x \sin x \, dx = e^x \sin x - e^x \cos x \cancel{- \int e^x \sin x \, dx}$

$+ \int e^x \sin x \, dx \qquad \cancel{+ \int e^x \sin x \, dx}$

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

33) $\int_0^{\pi} x \sin x \, dx$

$u = x \qquad v = -\cos x$

$du = dx \quad dv = \sin x \, dx$

$\Big|_0^{\pi} -x\cos x + \int_0^{\pi} + \cos x \, dx$

$\Big|_0^{\pi} -x \cos x + \sin x$

$[-\pi \cos \pi + \sin \pi] - [-0 \cdot \cos 0 + \sin 0]$

π

$\int_{\pi}^{2\pi} x \sin x \, dx$

$\Big|_{\pi}^{2\pi} -x\cos x + \sin x$

$[-2\pi \cos 2\pi + \sin 2\pi] - [-\pi \cos \pi + \sin \pi]$

$-2\pi - \pi = \boxed{-3\pi}$

3π

$\int_0^{2\pi} \qquad \int_0^{\pi} + \int_{\pi}^{2\pi}$

$\pi + 3\pi = 4\pi$

6.3

23) $\int x^3 e^{-2x}\,dx$

SIGN	u	dv
+	x^3	e^{-2x}
−	$3x^2$	$-\frac{1}{2}e^{-2x}$
+	$6x$	$\frac{1}{4}e^{-2x}$
−	6	$-\frac{1}{8}e^{-2x}$
+	0	$\frac{1}{16}e^{-2x}$

$$\boxed{-\frac{1}{2}x^3e^{-2x}-\frac{3}{4}x^2e^{-2x}-\frac{3}{4}xe^{-2x}-\frac{3}{8}e^{-2x}+C}$$

11) $\frac{dy}{dx}=(x+2)\sin x$ $\quad u=x+2 \quad v=-\cos x$

$\int dy=\int(x+2)\sin x\,dx \quad du=dx \quad dv=\sin x\,dx$

$y=(x+2)(-\cos x)+\sin x+C$

$(x+2)(-\cos x)+\int +\cos x\,dx$

$2=(0+2)(-\cos 0)+\cancel{\sin 0}+C$

$2=-2+C$

$4=C$

$$\boxed{y=(x+2)(-\cos x)+\sin x+4}$$

6.3

(7) $\int 3x^2 e^{2x}\,dx$

SIGN	u	dv
+	$3x^2$	e^{2x}
−	$6x$	$\frac{1}{2}e^{2x}$
+	6	$\frac{1}{4}e^{2x}$
−	0	$\frac{1}{8}e^{2x}$

$\frac{3}{2}x^2e^{2x} + -\frac{3}{2}xe^{2x} + \frac{3}{4}e^{2x} + C$