3) $\int xe^{2x}dx =$ $\qquad \int u\,dv = uv - \int v\,du$

$u = x \qquad v = \frac{1}{2}e^{2x}$

$du = dx \qquad dv = e^{2x}dx$

$\int e^{2x}dx = \frac{1}{2}\int e^{u}du = \frac{1}{2}e^{2x}$

$u = 2x$
$du = 2dx$

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

$= \frac{1}{2}xe^{2x} - \frac{1}{2}\cdot\frac{1}{2}e^{2x} + C$

$= \frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x} + C$

6) $\int t^2\sqrt{t-2}\,dt = \frac{2}{3}t^2(t-2)^{\frac{3}{2}} - \int \frac{4}{3}t(t-2)^{\frac{3}{2}}dt$

$u = t^2 \qquad v = \frac{2}{3}(t-2)^{\frac{3}{2}}$

$du = 2t\,dt \qquad dv = \sqrt{t-2}\,dt$

$\left\{ \begin{array}{l} u = t-2 \Rightarrow t = u+2 \\ du = dt \end{array} \right.$

$= \frac{2}{3}t^2(t-2)^{\frac{3}{2}} - \frac{4}{3}\int (u+2)u^{\frac{3}{2}}du$

$= \frac{2}{3}t^2(t-2)^{\frac{3}{2}} - \frac{4}{3}\int u^{\frac{5}{2}} + 2u^{\frac{3}{2}}du$

$= \frac{2}{3}t^2(t-2)^{\frac{3}{2}} - \frac{4}{3}\cdot\frac{2}{7}u^{\frac{7}{2}} - \frac{8}{3}\cdot\frac{2}{5}u^{\frac{5}{2}} + C$

$= \frac{2}{3}t^2(t-2)^{\frac{3}{2}} - \frac{8}{21}(t-2)^{\frac{7}{2}} - \frac{16}{15}(t-2)^{\frac{5}{2}} + C$

9) $\int \sin(\ln x)\,dx = x\sin(\ln x) - \int \cos(\ln x)\,dx$

$u = \sin(\ln x) \quad v = x$

$du = \frac{1}{x}\cos(\ln x)\,dx \quad dv = dx$

$u = \cos(\ln x) \quad v = x$

$du = \frac{-1}{x}\sin(\ln x) \quad dv = dx$

$\int \sin(\ln x)\,dx = x\sin(\ln x) - x\cos(\ln x) - \int \sin(\ln x)\,dx$

$2\int \sin(\ln x)\,dx = x\sin(\ln x) - x\cos(\ln x) + C$

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

10) $\int_{-1}^{1} \arctan x\,dx = x\arctan x - \int \frac{x}{1+x^2}\,dx$

$u = \arctan x \quad v = x$

$du = \frac{1}{1+x^2}\,dx \quad dv = dx$

$u = 1+x^2$

$du = 2x\,dx$

$= x\arctan x - \frac{1}{2}\int \frac{1}{u}\,du$

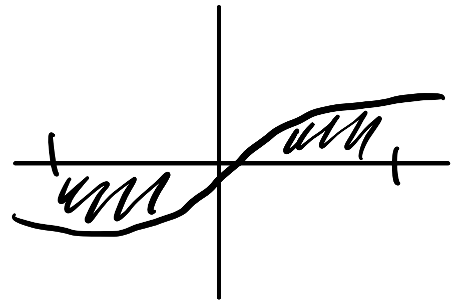
$= x\arctan x - \frac{1}{2}\ln|u| \Big|$

$= x\arctan x - \frac{1}{2}\ln(1+x^2) \Big]_{-1}^{1}$

$= \arctan(1) - \frac{1}{2}\ln(2) - \left[-\arctan(-1) - \frac{1}{2}\ln(2)\right]$

$$= \frac{\pi}{4} - \frac{1}{2}\ln(2) + -\frac{\pi}{4} + \frac{1}{2}\ln(2)$$

$$= 0$$



8) $v(t) = t^2 e^{-t}$ $\quad t=0$ to $t=5$

$$\int_0^5 t^2 e^{-t}\,dt = -t^2 e^{-t} + \int_0^5 2te^{-t}\,dt$$

$u = t^2 \qquad v = -e^{-t}$

$du = 2t\,dt \qquad dv = e^{-t}\,dt$

$u = 2t \qquad v = -e^{-t}$

$du = 2\,dt \qquad dv = e^{-t}\,dt$

$$= -t^2 e^{-t} - 2te^{-t} + \int_0^5 2e^{-t}\,dt$$

$$= -t^2 e^{-t} - 2te^{-t} - 2e^{-t} \Big|_0^5$$

$$= -25e^{-5} - 10e^{-5} - 2e^{-5} - [0 - 0 - 2\cdot 1]$$

$$= -37e^{-5} + 2$$