Chapter 7 Section 2

(9) $\int xe^{-2x}dx = x\left(-\frac{1}{2}e^{-2x}\right) - \int -\frac{1}{2}e^{-2x}dx = -\frac{x}{2}e^{-2x} - \frac{1}{4}e^{-2x} + C$

Let $u = x$ $\quad dv = -\frac{1}{2}e^{-2x}$

$du = 1$ $\quad v = e^{-2x}dx$

(11) $\int x^3e^x dx = x^3e^x - \int 3x^2e^x dx$

Let $u = x^3$ $\quad dv = e^x$

$du = 3x^2dx$ $\quad v = e^x dx$

$-3\int x^2e^x dx = -3\left\{x^2e^x - \int 2xe^x dx\right\} = -3x^2e^x + 6\int xe^x dx$

Let $u = x^2$ $\quad v = e^x$

$du = 2xdx$ $\quad dv = e^x dx$

$6\int xe^x dx = 6\left\{xe^x - \int e^x dx\right\} = 6xe^x - 6e^x$

Let $u = x$ $\quad v = e^x$

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

If we put it all together we get

$\int x^3e^x dx = x^3e^x - 3x^2e^x + 6xe^x - 6e^x + C$

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

Let $u = x^3 \Rightarrow du = 3x^2dx$

$\therefore \int x^2e^{x^3}dx = \frac{1}{3}\int e^u du = \frac{1}{3}e^u + C = \frac{1}{3}e^{x^3} + C$

(15) $\int t(\ln(t+1)dt = \frac{1}{2}t^2\ln(t+1) - \frac{1}{2}\int \frac{t^2}{t+1}dt$

Let $u = \ln(t+1)$ $\quad v = \frac{1}{2}t^2$

$du = \frac{1}{t+1}dt$ $\quad dv = tdt$

$\int \frac{t^2}{t+1}dt = \frac{1}{2}t^2 + x + \ln|t-1| + C$ (see soltion manual chapter 7 section 1 #21 to see how to solve eq)

$\therefore \int t(\ln(t+1)dt = \frac{1}{2}t^2\ln(t+1) - \frac{1}{4}t^2 - \frac{1}{2}t - \frac{1}{2}\ln|t+1| + C$