hw set 7
sect 5.6
p398

1. $\int x \ln x \, dx$

$u = \ln x$	$du = 1/x \, dx$
$dv = x \, dx$	$v = \frac{1}{2}x^2$

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

$= \frac{1}{2}x^2 \ln x - \frac{1}{4}x^2 + c$

2. $\int \theta \cos\theta \, d\theta$

$u = \theta$	$du = 1 d\theta$
$dv = \cos\theta \, d\theta$	$v = \sin\theta$

$= \theta \sin\theta - \int \sin\theta \, d\theta$

$= \theta \sin\theta + \cos\theta + c$

3. $\int x \cos 5x \, dx$

$u = x$	$du = 1$
$dv = \cos 5x$	$v = \frac{1}{5}\sin 5x$

$= \frac{1}{5}x \sin 5x - \int \frac{1}{5}\sin 5x$

$= \frac{1}{5}x \sin 5x + \frac{1}{25}\cos 5x + C$

4. $\int x e^{-x} dx$

$u = x$	$du = 1$
$dv = e^{-x}$	$v = -e^{-x}$

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

$= -xe^{-x} - e^{-x} + C$

5. $\int r e^{r/2} dr$

$u = r$	$du = 1$
$dv = e^{r/2}$	$v = 2e^{r/2}$

$= 2re^{r/2} - \int 2e^{r/2} dr$

$= 2re^{r/2} - 4e^{r/2} + C$

6. $\int t \sin 2t \, dt$

$u = t$	$du = 1$
$dv = \sin 2t$	$v = -\frac{\cos 2t}{2}$

$= -\frac{1}{2}t\cos 2t + \int \frac{1}{2}\cos 2t$

$= -\frac{1}{2}t\cos 2t + \frac{1}{4}\sin 2t + C$

16. $\int_0^1 (x^2+1)e^{-x} dx$

sign	u	dv
+	x^2+1	e^{-x}
−	$2x$	$-e^{-x}$
+	2	e^{-x}
−	0	$-e^{-x}$

$= -(x^2+1)e^{-x} - 2xe^{-x} - 2e^{-x}$

$= -e^{-x}(x^2+2x+3)\Big|_0^1$

$= [-e^{-1}(6)] - [-e^{0}(3)]$

$= -6/e + 3 = \frac{3e-6}{e} = .79272335 3$

17. $\int_1^2 \frac{\ln x}{x^2} dx$

$u = \ln x \quad du = 1/x$

$dv = x^{-2} \quad v = -x^{-1}$

$= -\frac{\ln x}{x} + \int x^{-2} dx$

$= -\frac{\ln x}{x} - x^{-1}\Big|_1^2 = -\frac{(\ln x + 1)}{x}\Big|_1^2$

$= -\frac{\ln 2 + 1}{2} + \frac{\ln 1 + 1}{1}$

$= -\frac{\ln 2}{2} + \frac{1}{2} = \frac{1 - \ln 2}{2} = .1534264$

23. $\int_1^2 (\ln x)^2 dx$

$u = (\ln x)^2$	$du = \frac{2\ln x}{x}$
$dv = 1$	$v = x$

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

$u = 2\ln x$	$du = 2/x$
$dv = 1$	$v = x$

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

$= (x(\ln x)^2 - 2x\ln x + 2x)\Big|_1^2$

$= [2(\ln 2)^2 - 4\ln 2 + 4]$

$- [0 - 0 + 2]$

$= 2(\ln 2)^2 - 4\ln 2 + 2$

$= .1883173056$

27. $\int_{\sqrt{\pi/2}}^{\sqrt{\pi}} \theta^3 \cos(\theta^2) \, d\theta$

Let $x = \theta^2 \longrightarrow \theta = \sqrt{x}$

$dx = 2\theta \, d\theta$

$= \int \frac{1}{2}x \cos x \, dx$

$u = 1/2 \, x$	$du = 1/2$
$dv = \cos x$	$v = \sin x$

$= 1/2 \, x \sin x - \int 1/2 \sin x$

$= 1/2 \, x \sin x + 1/2 \cos x$

$= 1/2 \, \theta^2 \sin\theta^2 + 1/2 \cos\theta^2 \Big|_{\sqrt{\pi/2}}^{\sqrt{\pi}}$

$= [1/2 \, \pi \sin\pi + 1/2 \cos\pi]$

$- [1/2 \cdot \pi/2 \cdot \sin(\pi/2) + 1/2 \cos(\pi/2)]$

$= -1/2 - [\pi/4] = -\frac{(2+\pi)}{4}$

$= -1.285398163$