MAT 176

Solutions to HW2

a) $\int e^{-t}\cos t\,dt$ — Int. by Parts $\left(\begin{matrix} u = e^{-t} \\ du = -e^{-t}dt \end{matrix} \quad \begin{matrix} v = \sin t \\ dv = \cos t\,dt \end{matrix}\right)$

$$= e^{-t}\sin t + \int e^{-t}\sin t\,dt$$

Int. by Parts: $u = e^{-t}$, $du = -e^{-t}dt$, $v = -\cos t$, $dv = \sin t\,dt$

$$= e^{-t}\sin t - e^{-t}\cos t - \int e^{-t}\cos t\,dt$$

$$\Rightarrow 2I = 2\int e^{-t}\cos t\,dt = e^{-t}(\sin t - \cos t) + C$$

$$\Rightarrow I = \int e^{-t}\cos t\,dt = \frac{e^{-t}}{2}(\sin t - \cos t) + C$$

b) $\int \sin^4 x \cos^3 x\,dx = \int \sin^4 x \cdot \cos^2 x \cos x\,dx$

$$= \int \sin^4 x (1 - \sin^2 x)\cos x\,dx$$

$u = \sin x$, $du = \cos x\,dx$

$$= \int u^4(1 - u^2)\,du$$

$$= \int u^4 - u^6\,du$$

$$= \frac{u^5}{5} - \frac{u^7}{7} + C$$

$$= \frac{1}{5}\sin^5 x - \frac{1}{7}\sin^7 x + C$$