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MAT 104

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COMP. ENGINEERING

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Computer Engineering  
MAT 104

1)  $\int x^b \ln x$   
 $u = \ln x \cdot dv = x^b$   
 $\frac{du}{dx} = \frac{1}{x} \cdot dv = x^b \Rightarrow v = \frac{x^{b+1}}{b+1}$   
 $\int x^b \ln x = \ln x \cdot \frac{x^{b+1}}{b+1} - \int \frac{x^{b+1}}{b+1} \cdot \frac{1}{x}$   
 $\int x^b \ln x = \ln x \cdot \frac{x^{b+1}}{b+1} - \frac{x^{b+1}}{(b+1)^2} \cdot \ln x + c$   
 $\int x^b \ln x = \ln x \left[ \frac{x^{b+1}}{b+1} - \frac{x^{b+1}}{(b+1)^2} \right] + c$   
 $= \ln x \left[ \frac{2x^{3/2}}{3} - \frac{4x^{3/2}}{4} \right] + c$

2)  $\int 2 \cos 6t \cos t dt$

$\cos A \cos B = \frac{1}{2} [\cos(A+B) + \cos(A-B)]$   
 $A = 6t, B = t$   
 $= \frac{1}{2} [\cos 7t + \cos 5t]$   
 $= \frac{1}{2} [\cos 7t + \cos 5t]$   
 $= \int \frac{\cos 7t + \cos 5t}{2} dt + c$   
 $= \frac{\sin 7t}{7} + \frac{\sin 5t}{5} + c //$

3)  $\int \sin^2 x \cos^3 x dx$   
 $u = \cos x$   
 $\frac{du}{dx} = -\sin x \Rightarrow dx = \frac{du}{-\sin x}$   
 $\int \cos^2 x \sin^2 x dx$   
 $\int u^2 \sin^2 x \cdot \frac{-du}{\sin x}$

$$\begin{aligned} &= \int u^4 \sin x \cdot dx \\ &= - \int u^4 \sin x \cdot du \\ &\text{Recall that} \\ &\sin x + \cos x = 1 \\ &\sin x = 1 - \cos x \\ &- \int \sin x \cdot u^4 \cdot du \\ &- \int (1 - \cos x) u^4 \cdot du \\ &\text{but } u = \cos x \\ &- \int (1 - u^2) u^4 \cdot du \\ &- \int (u^4 - u^6) \cdot du \\ &- \left[ \frac{u^{4+1}}{4+1} - \frac{u^{6+1}}{6+1} \right] + C \\ &- \left[ \frac{u^5}{5} - \frac{u^7}{7} \right] + C \\ &- \left[ \frac{(\cos x)^5}{5} - \frac{(\cos x)^7}{7} \right] + C // \end{aligned}$$