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Assignment ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~ ~~10~~ ~~11~~ ~~12~~ ~~13~~ ~~14~~ ~~15~~ ~~16~~ ~~17~~ ~~18~~ ~~19~~ ~~20~~ ~~21~~ ~~22~~ ~~23~~ ~~24~~ ~~25~~ ~~26~~ ~~27~~ ~~28~~ ~~29~~ ~~30~~ ~~31~~ ~~32~~ ~~33~~ ~~34~~ ~~35~~ ~~36~~ ~~37~~ ~~38~~ ~~39~~ ~~40~~ ~~41~~ ~~42~~ ~~43~~ ~~44~~ ~~45~~ ~~46~~ ~~47~~ ~~48~~ ~~49~~ ~~50~~ ~~51~~ ~~52~~ ~~53~~ ~~54~~ ~~55~~ ~~56~~ ~~57~~ ~~58~~ ~~59~~ ~~60~~ ~~61~~ ~~62~~ ~~63~~ ~~64~~ ~~65~~ ~~66~~ ~~67~~ ~~68~~ ~~69~~ ~~70~~ ~~71~~ ~~72~~ ~~73~~ ~~74~~ ~~75~~ ~~76~~ ~~77~~ ~~78~~ ~~79~~ ~~80~~ ~~81~~ ~~82~~ ~~83~~ ~~84~~ ~~85~~ ~~86~~ ~~87~~ ~~88~~ ~~89~~ ~~90~~ ~~91~~ ~~92~~ ~~93~~ ~~94~~ ~~95~~ ~~96~~ ~~97~~ ~~98~~ ~~99~~ ~~100~~

1)  $x^{1/2} \ln x$

$$\int x^{1/2} \ln x$$

$$u = x^{1/2} \quad du = \ln x$$

$$\frac{du}{dx} = \frac{1}{2} x^{-1/2}$$

$$\int v \frac{dv}{dx} + \int u \frac{du}{dx}$$

$$\ln x \int x^{1/2} + x^{1/2} \int \frac{d \ln x}{dx}$$

$$\ln x \left[ \frac{x^{3/2}}{3/2} \right] + x^{1/2} \left[ \frac{1}{x} \right] + C$$

$$\frac{2 \ln x \cdot x^{3/2}}{3} + \frac{x^{1/2}}{x} + C$$

$$\frac{2x^{3/2} \ln x}{3} + \frac{\sqrt{x}}{x} + C$$

2)  $2 \cos 6t \cos 5t$

$$\int 2 \cos 6t \cos 5t dt = 2 \int \cos 6t \cos 5t dt$$

$$A = 6t, \quad B = 5t$$

$$\begin{aligned} \cos A \cos B &= \frac{1}{2} [\cos(A+B) + \cos(A-B)] \\ &= \frac{1}{2} [\cos(6+5) + \cos(6-5)] \\ &= \frac{1}{2} [\cos 7t + \cos 5t] \end{aligned}$$

$$\int 2 \cos 6t \cos 5t dt = \frac{1}{2} (2 \cos 7t + \cos 5t)$$

$$= \frac{2}{2} \left[ \frac{\sin 7t}{7} - \frac{\sin 5t}{5} \right]$$

$$= \frac{\sin 7t}{7} - \frac{\sin 5t}{5} + C$$

$$9) \int \sin^3 x \cos^4 x \, dx$$

$$u = \cos x$$

$$\frac{du}{dx} = -\sin x \Rightarrow dx = \frac{du}{-\sin x}$$

$$\int \cos^4 x \sin^3 x \, dx$$

$$\int u^4 \sin^2 x \frac{-du}{\sin x}$$

$$= \int u^4 \sin^2 x \, dx = -\int u^4 \sin^2 x \cdot du$$

Recall that

$$\sin^2 x + \cos^2 x = 1$$

$$\sin^2 x = 1 - \cos^2 x \Rightarrow \int \sin^2 x u^4 \cdot du = \int (1 - \cos^2 x) u^4 \, du$$

$$\text{but } u = \cos x$$

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

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

$$= \left[ \frac{u^5}{5} - \frac{u^7}{7} \right] + C$$

$$= \left[ \frac{u^5}{5} - \frac{u^7}{7} \right] + C$$

$$\frac{(\cos x)^5}{5} - \frac{(\cos x)^7}{7} + C$$