Georgia Sugisandhea - 535230080 TUGAS KALKULUS 5

1. $\int 2x(3x+9)^{11}\,dx$

$u = 2x \rightarrow du = 2\,dx$

$dv = (3x+9)^{11}\,dx \rightarrow v = \int (3x+9)^{11}\,dx$

$\hookrightarrow u = 3x+9$

$\frac{du}{dx} = 3$

$\int u^{11}\,\frac{du}{3}$

$\frac{1}{3}\,\frac{1}{12}u^{12} \rightarrow v = \frac{1}{36}u^{12} = \frac{1}{36}(3x+9)^{12}$

$\hookrightarrow \int 2x(3x+9)^{11}\,dx = 2x \cdot \frac{1}{36}(3x+9)^{12} - \int \frac{1}{36}(3x+9)^{12} \cdot 2\,dx$

$= \frac{1}{18}x(3x+9)^{12} - \int \frac{1}{18}(3x+9)^{12}\,dx$

$\hookrightarrow u = 3x+9$

$\frac{du}{dx} = 3$

$= \frac{1}{18}x(3x+9)^{12} - \int \frac{1}{18}(u)^{12} \cdot \frac{du}{3}$

$= \frac{1}{18}x(3x+9)^{12} - \int \frac{1}{54}(u)^{12}\,du$

$= \frac{1}{18}x(3x+9)^{12} - \frac{1}{54 \cdot 13}(u)^{13}$

$= \frac{1}{18}x(3x+9)^{12} - \frac{1}{702}(3x+9)^{13} + C$

2. $\int x\cos x\,dx \longrightarrow = x\sin x - \int \sin x \cdot dx$

$u = x \rightarrow du = 1\,dx$ $= x\sin x - (-\cos x)$

$dv = \cos x\,dx \rightarrow \int \cos x\,dx$ $= x\sin x + \cos x + C$

$v = \sin x$

3. $\int x^2 \sin x\,dx \longrightarrow u = x^2 \rightarrow du = 2x\,dx$

$dv = \sin x\,dx \rightarrow v = \int \sin x\,dx$

$v = -\cos x$

$\hookrightarrow x^2 \cdot -\cos x - \int -\cos x \cdot 2x\,dx$

$-x^2\cos x - \int -2x\cos x\,dx \rightarrow u = -2x \rightarrow du = -2\,dx$

$dv = \cos x\,dx \rightarrow v = \int \cos x\,dx$

$v = \sin x$

$-x^2\cos x - \left[(-2x)(\sin x) - \int \sin x \cdot -2\,dx\right]$

$-x^2\cos x - \left[-2x\sin x - (-2)\cdot(-\cos x)\right]$

$-x^2\cos x + 2x\sin x + 2\cos x + C$

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4 $\int x\sqrt{2x+1}\,dx = \int x(2x+1)^{\frac{1}{2}}\,dx \rightarrow u = x \rightarrow du = 1\,dx$

$dv = (2x+1)^{\frac{1}{2}}\,dx$

$v = \int (2x+1)^{\frac{1}{2}}\,dx$

↳ $u = 2x+1$

$\frac{du}{2} = dx$

$v = \int (u)^{\frac{1}{2}} \frac{du}{2}$

$v = \int \frac{1}{2}(u)^{\frac{1}{2}}\,du$

$v = \frac{1}{2} \cdot \frac{1}{\frac{3}{2}} u^{\frac{3}{2}}$

$v = \frac{1}{3} u^{\frac{3}{2}} = \frac{1}{3}(2x+1)^{\frac{3}{2}}$

↳ $= x \cdot \frac{1}{3}(2x+1)^{\frac{3}{2}} - \int \frac{1}{3}(2x+1)^{\frac{3}{2}} \cdot dx$

↳ $u = 2x+1$

$\frac{du}{2} = dx$

$= \frac{1}{3}x(2x+1)^{\frac{3}{2}} - \int \frac{1}{3}(u)^{\frac{3}{2}} \cdot \frac{du}{2}$

$= \frac{1}{3}x(2x+1)^{\frac{3}{2}} - \frac{1}{6} \cdot \frac{1}{\frac{5}{2}}(u)^{\frac{5}{2}}$

$= \frac{1}{3}x(2x+1)^{\frac{3}{2}} - \frac{1}{15}(u)^{\frac{5}{2}}$

$= \frac{1}{3}x(2x+1)^{\frac{3}{2}} - \frac{1}{15}(2x+1)^{\frac{5}{2}}$

5. $\int \ln x\,dx \rightarrow u = \ln x \rightarrow du = \frac{1}{x}\,dx$

$dv = dx \rightarrow v = \int dx = x$

↳ $= \ln x \cdot x - \int x \cdot \frac{1}{x}\,dx$

$= x\ln x - \int dx$

$= x\ln x - x$

6 $\int x\ln x\,dx \rightarrow u = \ln x \rightarrow du = \frac{1}{x}\,dx$

$dv = x\,dx \rightarrow v = \int x\,dx$

$= \frac{1}{2}x^2$

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

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

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

$\ln x \cdot \frac{1}{2}x^2 - \frac{1}{2} \cdot \frac{1}{2}x^2$

$\ln x \cdot \frac{1}{2}x^2 - \frac{1}{4}x^2$