

DAY 110 Ch 7

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$$(3) \int e^{3x} dx$$

$$\begin{aligned} u &= 3x \\ du &= 3dx \\ \frac{1}{3}du &= dx \end{aligned}$$

$$\begin{aligned} \frac{1}{3} \int e^u du &= \frac{1}{3} e^u + C \rightarrow \boxed{\frac{1}{3} e^{3x} + C} \end{aligned}$$

$$(4) \int te^{t^2} dt$$

$$\begin{aligned} u &= t^2 \\ du &= 2t dt \\ \frac{1}{2}du &= t dt \end{aligned}$$

$$\begin{aligned} \frac{1}{2} \int e^u du &= \frac{1}{2} e^u + C \rightarrow \boxed{\frac{1}{2} e^{t^2} + C} \end{aligned}$$

$$(5) \int e^{-x} dx$$

$$\begin{aligned} u &= -x \\ du &= -dx \\ -du &= dx \end{aligned}$$

$$\begin{aligned} - \int e^u du &= -e^u + C \rightarrow \boxed{-e^{-x} + C} \end{aligned}$$

$$(6) \int 25e^{-0.2t} dt$$

$$\begin{aligned} u &= -0.2t \\ du &= -0.2dt \\ -5du &= -\frac{1}{2}dt \end{aligned}$$

$$\begin{aligned} -125 \int e^u du &= -125 e^u + C \rightarrow \boxed{-125 e^{-0.2t} + C} \end{aligned}$$

$$(7) \int \sin(2x) dx$$

$$\begin{aligned} u &= 2x \\ du &= 2dx \\ \frac{1}{2}du &= dx \end{aligned}$$

$$\begin{aligned} \frac{1}{2} \int \sin u du &= -\frac{1}{2} \cos u + C \rightarrow \boxed{-\frac{1}{2} \cos(2x) + C} \end{aligned}$$

$$(8) \int t \cos(t^2) dt$$

$$\begin{aligned} u &= t^2 \\ du &= 2t dt \\ \frac{1}{2}du &= t dt \end{aligned}$$

$$\begin{aligned} \frac{1}{2} \int \cos u du &+ \frac{1}{2} \sin u + C \rightarrow \boxed{\frac{1}{2} \sin(t^2) + C} \end{aligned}$$

$$(9) \int \sin(3-t) dt$$

$$\begin{aligned} u &= 3-t \\ du &= -1 dt \\ -du &= dt \end{aligned}$$

$$\begin{aligned} - \int \sin u du &+ \cos u + C \rightarrow \boxed{\cos(3-t) + C} \end{aligned}$$

$$(10) \int xe^{-x^2} dx$$

$$\begin{aligned} u &= -x^2 \\ du &= -2x dx \\ -\frac{1}{2}du &= x dx \end{aligned}$$

$$\begin{aligned} -\frac{1}{2} \int e^u du &- \frac{1}{2} e^u + C \rightarrow \boxed{-\frac{1}{2} e^{-x^2} + C} \end{aligned}$$

$$(11) \int (r+1)^3 dr$$

$$\begin{aligned} u &= r+1 \\ du &= 1 dr \end{aligned}$$

$$\begin{aligned} \int u^3 du &+ \frac{1}{4} u^4 + C \rightarrow \boxed{\frac{1}{4} (r+1)^4 + C} \end{aligned}$$

$$(12) \int y (y^2+5)^8 dy$$

$$\begin{aligned} u &= y^2+5 \\ du &= 2y dy \\ \frac{1}{2}du &= y dy \end{aligned}$$

$$\begin{aligned} \frac{1}{2} \int (u)^8 du &+ \frac{1}{18} u^9 + C \rightarrow \boxed{\frac{1}{18} (y^2+5)^9 + C} \end{aligned}$$

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$$\textcircled{13} \quad \int x^2(1+2x^3)dx = \begin{aligned} u &= 1+2x^3 \\ du &= 6x^2dx \\ \frac{1}{6}du &= x^2dx \end{aligned} \quad \begin{aligned} \frac{1}{6} \int u du \\ \frac{1}{12}u^2 + C \end{aligned} \rightarrow \boxed{\frac{1}{12}(1+2x^3)^2 + C}$$

$$\textcircled{14} \quad \int t^2(t^3-3)^{10}dt = \begin{aligned} u &= t^3-3 \\ du &= 3t^2dt \\ \frac{1}{3}du &= t^2dt \end{aligned} \quad \begin{aligned} \frac{1}{3} \int u^{10}du \\ \frac{1}{33}u^{11} + C \end{aligned} \rightarrow \boxed{\frac{1}{33}(t^3-3)^{11} + C}$$

$$\textcircled{15} \quad \int x(x^2+3)^2dx = \begin{aligned} u &= x^2+3 \\ du &= 2xdx \\ \frac{1}{2}du &= xdx \end{aligned} \quad \begin{aligned} \frac{1}{2} \int u^2du \\ \frac{1}{6}u^3 + C \end{aligned} \rightarrow \boxed{\frac{1}{6}(x^2+3)^3 + C}$$

$$\textcircled{16} \quad \int x(x^2-4)^{\frac{7}{2}}dx = \begin{aligned} u &= x^2-4 \\ du &= 2xdx \\ \frac{1}{2}du &= xdx \end{aligned} \quad \begin{aligned} \frac{1}{2} \int u^{\frac{7}{2}}du \\ \frac{2}{9} \frac{1}{2}u^{\frac{9}{2}} + C \\ \frac{1}{9}u^{\frac{9}{2}} + C \end{aligned} \rightarrow \boxed{\frac{1}{9}(x^2-4)^{\frac{9}{2}} + C}$$

$$\textcircled{17} \quad \int y^2(1+y)^2dy \quad u = ?$$

$$\int y^2(1+2y+y^2)dy$$

$$\int (y^4+2y^3+y^2)dy = \frac{1}{5}y^5 + \frac{1}{2}y^4 + \frac{1}{3}y^3 + C$$

$$\textcircled{18} \quad \int (2t-7)^{73}dt = \begin{aligned} u &= 2t-7 \\ du &= 2dt \\ \frac{1}{2}du &= dt \end{aligned} \quad \begin{aligned} \frac{1}{2} \int u^{73}du \\ (\frac{1}{74})\frac{1}{2}u^{74} + C \\ \frac{1}{148}u^{74} + C \end{aligned} \rightarrow \boxed{\frac{1}{148}(2t-7)^{74} + C}$$

$$\textcircled{19} \quad \int x^2e^{x^2+1}dx = \begin{aligned} u &= x^2+1 \\ du &= 2xdx \\ \frac{1}{2}du &= xdx \end{aligned} \quad \begin{aligned} \frac{1}{2} \int e^u du \\ = \frac{1}{2}e^u + C \end{aligned} \rightarrow \boxed{\frac{1}{2}e^{x^2+1} + C}$$

$$\textcircled{20} \quad \int \frac{dy}{y+5} = \ln|y+5| + C$$

$$\textcircled{21} \quad \int \frac{1}{\sqrt{4-x}}dx = \int (4-x)^{-\frac{1}{2}}dx \quad \begin{aligned} u &= 4-x \\ du &= -dx \\ -du &= dx \end{aligned} \quad \begin{aligned} - \int u^{-\frac{1}{2}}du \\ -2u^{\frac{1}{2}} + C \end{aligned} \rightarrow \boxed{-2\sqrt{4-x} + C}$$

$$\textcircled{22} \quad \int (x^2+3)^2dx = \begin{aligned} u &= x^2+3 \\ du &= 2xdx \\ \frac{1}{2}du &= xdx \end{aligned} \quad \begin{aligned} \int (x^4+6x^2+9)dx \\ \frac{1}{5}x^5 + 2x^3 + 9x + C \end{aligned} \quad \text{cont'd w-sub.}$$