DAY 110 Ch 7 p. 360 # 3-22

③ $\int e^{3x}dx$

$u=3x$
$du=3dx$
$\frac{1}{3}du=dx$

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

④ $\int te^{t^2}dt$

$u=t^2$
$du=2tdt$
$\frac{1}{2}du=tdt$

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

⑤ $\int e^{-x}dx$

$u=-x$
$du=-dx$
$-du=dx$

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

⑥ $\int 25e^{-.2t}dt$
$25\int e^{-.2t}dt$

$u=-.2t$
$du=-.2dt$
$-5du=-\frac{1}{5}dt$

$-125\int e^u du$
$=-125e^u+C \rightarrow \boxed{-125e^{-.2t}+C}$

⑦ $\int \sin(2x)dx$

$u=2x$
$du=2dx$
$\frac{1}{2}du=dx$

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

⑧ $\int t\cos(t^2)dt$

$u=t^2$
$du=2tdt$
$\frac{1}{2}du=tdt$

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

⑨ $\int \sin(3-t)dt$

$u=3-t$
$du=-1dt$
$-du=dt$

$-\int \sin u\,du$
$+\cos u+C \rightarrow \boxed{\cos(3-t)+C}$

⑩ $\int xe^{-x^2}dx$

$u=-x^2$
$du=-2xdx$
$-\frac{1}{2}du=xdx$

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

⑪ $\int (r+1)^3 dr$

$u=r+1$
$du=1dr$

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

⑫ $\int y(y^2+5)^8 dy$

$u=y^2+5$
$du=2ydy$
$\frac{1}{2}du=ydy$

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

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(13) $\int x^2(1+2x^3)\,dx =$ $u = 1+2x^3$, $du = 6x^2\,dx$, $\frac{1}{6}du = x^2\,dx$ → $\frac{1}{6}\int u\,du$ → $\frac{1}{12}u^2+C$ → $\boxed{\frac{1}{12}(1+2x^3)^2+C}$

(14) $\int t^2(t^3-3)^{10}\,dt$ $u = t^3-3$, $du = 3t^2\,dt$, $\frac{1}{3}du = t^2\,dt$ → $\frac{1}{3}\int u^{10}\,du$ → $\frac{1}{33}u^{11}+C$ → $\boxed{\frac{1}{33}(t^3-3)^{11}+C}$

(15) $\int x(x^2+3)^2\,dx$ $u = x^2+3$, $du = 2x\,dx$, $\frac{1}{2}du = x\,dx$ → $\frac{1}{2}\int u^2\,du$ → $\frac{1}{6}u^3+C$ → $\frac{1}{6}(x^2+3)^3+C$

(16) $\int x(x^2-4)^{7/2}\,dx$ $u = x^2-4$, $du = 2x\,dx$, $\frac{1}{2}du = x\,dx$ → $\frac{1}{2}\int u^{7/2}\,du$ → $\frac{2}{9}\cdot\frac{1}{2}u^{9/2}+C$ → $\frac{1}{9}u^{9/2}+C$ → $\boxed{\frac{1}{9}(x^2-4)^{9/2}+C}$

(17) $\int y^2(1+y)^2\,dy$ $u = ?$

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

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

(18) $\int (2t-7)^{73}\,dt$ $u = 2t-7$, $du = 2\,dt$, $\frac{1}{2}du = dt$ → $\frac{1}{2}\int u^{73}\,du$ → $\left(\frac{1}{74}\cdot\frac{1}{2}\right)u^{74}+C$ → $\frac{1}{148}u^{74}+C$ → $\boxed{\frac{1}{148}(2t-7)^{74}+C}$

(19) $\int x^2 e^{x^2+1}\,dx$ $u = x^2+1$, $du = 2x\,dx$, $\frac{1}{2}du = x\,dx$ → $\frac{1}{2}\int e^u\,du$ → $\frac{1}{2}e^u+C$ → $\boxed{\frac{1}{2}e^{x^2+1}+C}$

(20) $\int \frac{dy}{y+5} = \ln|y+5|+C$

(21) $\int \frac{1}{\sqrt{4-x}}\,dx = \int (4-x)^{-1/2}\,dx$ $u = 4-x$, $du = -dx$, $-du = dx$ → $-\int u^{-1/2}\,du$ → $-2u^{1/2}+C$ → $\boxed{-2\sqrt{4-x}+C}$

(22) $\int (x^2+3)^2\,dx =$ $u = x^2+3$, $du = 2x\,dx$, $\frac{1}{2}du = x\,dx$ can't do u-sub.

$\int (x^4+6x^2+9)\,dx$

$\boxed{\frac{1}{5}x^5+2x^3+9x+C}$