① Find $\int 3(3x-5)^3\,dx$

Let $u = 3x-5$
$du = 3\,dx$

$= \int (u)^3\,du$

$= \frac{1}{4}u^4 + C$

$= \boxed{\frac{1}{4}(3x-5)^4 + C}$

② Find $\int 4e^{r-7}\,dr$

Let $u = r-7$
$du = 1\,dr$

$= \int 4e^u\,du$

$= 4e^u + C$

$= \boxed{4e^{r-7} + C}$

③ Find $\int 4v\,\operatorname{sech}^2(2v^2+1)\,dv$

Let $u = 2v^2+1$
$du = 4v\,dv$

$= \int \operatorname{sech}^2(u)\,du$

$= \tanh(u) + C$

$= \boxed{\tanh(2v^2+1) + C}$

(4) Find $\int \frac{2e^x}{e^x+3}\,dx$.

Let $u = e^x+3$

$du = e^x\,dx$

$= \int \frac{2}{u}\,du$

$= 2\ln|u| + C$

$= \boxed{2\ln(e^x+3)+C}$

(5) Find $\int 2t^3\sqrt{t^2+1}\,dt$

$= \int t^2\sqrt{t^2+1}\cdot 2t\,dt$

Let $u = t^2+1$ $\quad t^2 = u-1$

$du = 2t\,dt$

$= \int (u-1)\sqrt{u}\,du$

$= \int u^{3/2} - u^{1/2}\,du$

$= \frac{2}{5}u^{5/2} - \frac{2}{3}u^{3/2} + C$

$= \boxed{\frac{2}{5}(t^2+1)^{5/2} - \frac{2}{3}(t^2+1)^{3/2} + C}$

(6) Find $\int \frac{2(\ln s)^3}{s}\,ds$.

Let $u = \ln s$

$du = \frac{1}{s}\,ds$

$= \int 2u^3\,du$

$= 2\left(\frac{1}{4}u^4\right) + C$

$= \boxed{\frac{1}{2}(\ln s)^4 + C}$

(7) Find $\int \frac{3\sqrt{x}}{2(x^{3/2}+2)^2}\,dx$.

Let $u = x^{3/2} + 2$

$du = \frac{3}{2}x^{1/2}\,dx$

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

$= \int u^{-2}\,du$

$= -1u^{-1} + C$

$= \boxed{-\frac{1}{x^{3/2}+2} + C}$

(8) Find $\int \frac{\cos(1/y)}{y^2}\,dy$.

Let $u = 1/y = y^{-1}$

$du = -y^{-2}\,dy = -\frac{1}{y^2}\,dy$

$-du = +\frac{1}{y^2}\,dy$

$= -\int \cos(u)\,du$

$= -\sin(u) + C$

$= \boxed{-\sin(1/y) + C}$