EX 1 $\int \sin(2x-4)\,dx$

$u = 2x-4$

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

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

$= \frac{1}{2}\int \sin u \, du$

$= \frac{1}{2}(-\cos u) + C$

$= -\frac{1}{2}\cos(2x-4) + C$

$\int \sin(\text{linear polynomial})\,dx$

$= \frac{1}{\text{leading coeff.}}(-\cos(\text{lin. poly.}))$

$+C$

$\boxed{\int \sin(mx+b)\,dx} = \frac{1}{m}\int \sin u \, du$

$u = mx+b$

$du = m\,dx$

$\frac{1}{m}du = dx$

$= \frac{1}{m}(-\cos u) + C$

$= -\frac{1}{m}\cos(mx+b) + C$

EX 2 $\int x^4 \cos(\pi x^5 - \sqrt{7})\,dx$

$u = \pi x^5 - \sqrt{7}$

$\frac{du}{dx} = 5\pi x^4$

$\frac{1}{5\pi}du = x^4\,dx$

$= \frac{1}{5\pi}\int \cos(u)\,du$

$= \frac{1}{5\pi}\sin u + C$

$= \boxed{\frac{1}{5\pi}\sin(\pi x^5 - \sqrt{7}) + C}$

EX 3 $\int x^6\left(7x^7+\pi\right)^8 \sin\left[\left(7x^7+\pi\right)^9\right] dx$

$u=(7x^7+\pi)^9$

$\frac{du}{dx} = 9(7x^7+\pi)^8(49x^6)$

$du = 9(49)(7x^7+\pi)^8 x^6\, dx$

$\frac{1}{9(49)}\, du = (7x^7+\pi)^8 x^6\, dx$

$= \frac{1}{9(49)}\int \sin(u)\, du$

$= \frac{-1}{9(49)} \cos u + C$

$= \boxed{\frac{-1}{9(49)} \cos\left((7x^7+\pi)^9\right) + C}$

EX 4 $\int_0^2 \frac{x^2}{\left(9-x^3\right)^{\frac{3}{2}}} dx$

$= -\frac{1}{3}\int_9^1 \frac{1}{u^{3/2}}\, du$

$u = 9-x^3$

$\frac{du}{dx} = -3x^2$

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

$x=0,\ u=9-0^3=9$

$x=2,\ u=9-2^3=1$

$= -\frac{1}{3}\int_9^1 u^{-3/2}\, du$

$= -\frac{1}{3}\left(-2u^{-1/2}\Big|_9^1\right) = \frac{2}{3}\left(\frac{1}{\sqrt{u}}\Big|_9^1\right)$

$= \frac{2}{3}\left(\frac{1}{\sqrt{1}} - \frac{1}{\sqrt{9}}\right)$

$= \frac{2}{3}\left(1-\frac{1}{3}\right) = \boxed{\frac{4}{9}}$

28.5 Extra Integrating

EX 5 $\int_0^{\pi/2} \sin x \sin(\cos x)\,dx$

$u = \cos x$

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

$-du = \sin x\,dx$

$x = 0,\ u = \cos 0 = 1$

$x = \pi/2,\ u = \cos(\pi/2) = 0$

$= -\int_1^0 \sin u\,du$

$= \int_0^1 \sin u\,du$

$= -\cos u \Big|_0^1$

$= -\cos 1 - (-\cos 0)$

$= -\cos 1 + 1$

$= \boxed{1 - \cos 1}$

$-\int_a^b f(x)\,dx$

$= \int_b^a f(x)\,dx$

EX 6 $\int_1^2 \left(1+\frac{1}{t^2}\right)^2 \left(\frac{1}{t^2}\right) dt$

$= \int_1^2 \left(1+\frac{1}{t^2}\right)\left(1+\frac{1}{t^2}\right)\left(\frac{1}{t^2}\right) dt$

$= \int_1^2 \left(1+\frac{2}{t^2}+\frac{1}{t^4}\right)\left(\frac{1}{t^2}\right) dt$

$= \int_1^2 \left(\frac{1}{t^2}+\frac{2}{t^4}+\frac{1}{t^6}\right) dt = \int_1^2 \left(t^{-2}+2t^{-4}+t^{-6}\right) dt$

$= \left(\frac{t^{-1}}{-1} + \frac{2t^{-3}}{-3} + \frac{t^{-5}}{-5}\right)\Big|_1^2$

$= \left(\frac{-1}{t} - \frac{2}{3t^3} - \frac{1}{5t^5}\right)\Big|_1^2$

$= \left(\frac{-1}{2} - \frac{2}{3(8)} - \frac{1}{5(32)}\right) - \left(-1 - \frac{2}{3} - \frac{1}{5}\right)$

$= -\frac{1}{2} - \frac{1}{12} - \frac{1}{160} + 1 + \frac{2}{3} + \frac{1}{5}$

LCD = 480

$= -\frac{1}{2}\left(\frac{240}{240}\right) - \frac{1}{12}\left(\frac{40}{40}\right) - \frac{1}{160}\left(\frac{3}{3}\right) + \frac{480}{480} + \frac{2}{3}\left(\frac{160}{160}\right) + \frac{1}{5}\left(\frac{96}{96}\right)$

$= \frac{-240-40-3+480+320+96}{480}$

$= \frac{520+93}{480} = \boxed{\frac{613}{480}}$