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19/MHS01/059
MEDICINE AND SURGERY

1) $\int \frac{2x}{\sqrt{4x^2-1}}\,dx = 2\int \frac{x}{(4x^2-1)^{1/2}}\,dx$

$u = (4x^2-1)^{1/2}$

$u^2 = 4x^2 - 1 \quad u^2 + 1 = 4x^2$

$x = \sqrt{\frac{u^2+1}{4}} \quad \therefore u = \left(\frac{u^2+1}{4}\right)^{1/2}$

$\frac{dx}{du} = \frac{1}{2}\left(\frac{u^2+1}{4}\right)^{-1/2} \cdot \frac{u}{2}$

$dx = \frac{u\,du}{4}\left(\frac{u^2+1}{4}\right)^{-1/2}$

$2\int \left(\frac{u^2+1}{4}\right)^{1/2} \cdot \frac{1}{u} \cdot \frac{u\,du}{4}\left(\frac{u^2+1}{4}\right)$

$\frac{2}{4}\int \frac{u}{u}\,du$

$\frac{2}{4}\int du = \frac{1}{2}(u) + c$

$\int \frac{2x}{(4x^2-1)^{1/2}}\,du = \frac{\sqrt{4x^2-1}}{2} + c$

2) $\int \frac{\sin^{-1} x}{\sqrt{1-x^2}} \, dx$

$\sin^{-1}x \cdot \left(\sqrt{1^2 - x^2}\right)^{-1} dx$

$u = \sin^{-1} x$

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

$dx = dx \cdot du$

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

$du = \left(\sqrt{1^2 - x^2}\right)^{-1} dx$

$\int u \, du$

$\frac{u^2}{2} + C$

$\frac{(\sin^{-1} x)^2}{2} \, dx$

(3) $\int (\tan x)^6 \sec^2 x \, dx$

$u = \tan x$

$\frac{du}{dx} = \sec^2 x$

$du = \sec^2 x \, dx$

$\int u^6 \, du$

$\left(\frac{u^7}{7}\right) + c$

$\frac{(\tan x)^7}{7} + c$