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19/MHS01/287

415

MBBS

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COURSE: MATH 104

Assignment:

Soln.

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

$$\text{Let } p = 4x^2 - 1$$

$$p+1 = 4x^2$$

$$x = \sqrt{\frac{p+1}{4}} = \frac{(p+1)^{1/2}}{2}$$

$$\frac{dx}{dp} = \frac{1}{2} (p+1)^{-1/2} \cdot \frac{1}{2}$$

$$\frac{dx}{dp} = \frac{1}{4} (p+1)^{-1/2} = \frac{1}{4(p+1)^{1/2}}$$

$$dx = dp$$

$$4(p+1)^{1/2}$$

$$2 \int \frac{(p+1)^{1/2}}{4} \cdot p^{-1/2} \cdot dp$$

$$= \frac{1}{4} \int p^{-1/2} \cdot dp$$

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

$$= \frac{1}{4} \cdot (p^{1/2} \cdot 2) + C$$

$$= \frac{1}{2} (p^{1/2}) + C$$

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

$$= \frac{1}{2} \sqrt{4x^2-1} + C$$

$$c. \int dx = \int 1 dx$$

$$\int x^n dx = \int (x^0) dx$$

$$\frac{x^{0+1}}{1} = \frac{x^1}{1}$$

$$= x + C //$$

$$2. \int \frac{\sin^{-1} x}{\sqrt{1-x^2}} dx$$
$$\Rightarrow \int \frac{\sin^{-1} x \cdot dx}{\sqrt{1-x^2}} = \int \frac{\sin^{-1} x \cdot dx}{(1-x^2)^{1/2}}$$

$$\text{Let } p = \sin^{-1} x$$

$$dp = dx$$

$$(1-x^2)^{1/2}$$

$$= \int p dp = \frac{p^2}{2} + C$$

$$= \frac{(\sin^{-1} x)^2}{2} + C //$$

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

$$\text{Let } p = \tan x$$

$$dp = \sec^2 x dx$$

$$\int p^6 dp$$

$$= \frac{p^7}{7} + C$$

$$= \frac{(\tan x)^7}{7} + C //$$

$$b. \int a dx$$

$$\text{Recall: } \int dx = x + C$$

$$\int a dx = ax + C //$$