



Problem Set 30: Basic Rules of Integration

Find the integral of the following:

$$\begin{aligned}
 1. \int 4x \, dx \\
 &= 4 \frac{x^2}{2} + C \\
 &= 2x^2 + C
 \end{aligned}$$

$$\begin{aligned}
 2. \int x^3 \, dx \\
 &= \frac{x^4}{4} + C
 \end{aligned}$$

$$\begin{aligned}
 3. \int (3x^2 - 4x + 1) \, dx \\
 &= 3 \frac{x^3}{3} - 4 \frac{x^2}{2} + x + C \\
 &= x^3 - 2x^2 + x + C
 \end{aligned}$$

$$\begin{aligned}
 4. \int \frac{dx}{x^2} &= \int \frac{1}{x^2} \, dx = \int x^{-2} \, dx \\
 &= \frac{x^{-1}}{-1} + C \\
 &= -x^{-1} + C \text{ or } \frac{-1}{x} + C
 \end{aligned}$$

$$\begin{aligned}
 5. \int 2\sqrt{x} \, dx &= \int 2x^{1/2} \, dx \\
 &= 2 \frac{x^{3/2}}{3/2} + C \\
 &= 2x^{3/2} \left(\frac{2}{3}\right) + C \\
 &= \frac{4}{3} x^{3/2} + C
 \end{aligned}$$

$$\begin{aligned}
 6. \int \frac{3}{2\sqrt{x}} \, dx &= \int \frac{3}{2} x^{-1/2} \, dx \\
 &= \frac{3}{2} \frac{x^{1/2}}{1/2} + C \\
 &= \frac{3}{2} x^{1/2} (2) + C \\
 &= 3x^{1/2} + C \text{ or } 3\sqrt{x} + C
 \end{aligned}$$



7. $\int \frac{4}{9} x^{5/3} dx$

$$= \frac{4}{9} x^{8/3} \left(\frac{3}{8} \right) + C$$

$$= \frac{x^{8/3}}{6} + C$$

8. $\int \frac{x^2 + 3x - 2x^5}{x} dx$

$$= \int \left(\frac{x^2}{x} + \frac{3x}{x} - \frac{2x^5}{x} \right) dx$$

$$= \int (x + 3 - 2x^4) dx$$

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

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

9. $\int \cos x dx$

$$= \sin x + C$$

10. $\int \frac{\sin x dx}{\pi}$

$$= \frac{1}{\pi} \int \sin x dx$$

$$= -\frac{1}{\pi} \cos x + C$$



$$11. \int \sec^2 x \, dx$$

$$= \tan x + C$$

$$12. \int \csc x \cot x \, dx$$

$$= -\csc x + C$$

$$13. \int \frac{dx}{\sin^2 x}$$

$$\cancel{13.} = \int \csc^2 x \, dx$$

$$= -\cot x + C$$

$$14. \int \frac{\sec x \tan x}{8} \, dx$$

$$= \frac{1}{8} \int \sec x \tan x \, dx$$

$$= \frac{1}{8} \sec x + C$$