

C12 - 5.3 - Poly/Root Integration Notes

Integral: The Anti-Derivative. Who's Derivative is this? Take the Derivative to Check your Answer.

$$\int x dx = \frac{x^2}{2} + C \quad y = \frac{x^2}{2} + C \quad 3 \int \cancel{3} x^2 dx = 3 \frac{x^{2+1}}{3} + C$$

$$y' = \frac{2x}{2} \quad \text{In your Head!} \quad = x^3 + C = x^3 + C$$

$$y = x$$

$$\int 5 dx = 5 \int dx \quad \frac{5x^0}{5x^{0+1}} = 5x \quad \int 5x dx = 5 \int x dx$$

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

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

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

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

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

Separate Fractions

$$\int \frac{x^2 + 2x}{x} dx = \int (x + 2) dx$$

$$= \frac{x^2}{2} + 2x + c$$

$$\frac{x^2 + 2x}{x} = \frac{x^2}{x} + \frac{2x}{x}$$

$$= x + 2$$

$$\int (x + 2)^2 dx = \int (x^2 + 4x + 4) dx \quad \text{FOIL}$$

$$= \frac{x^3}{3} + \frac{4x^2}{2} + 4x + C$$

$$= \frac{x^3}{3} + 2x^2 + 4x + C$$

$$\int (2x + 3)^2 dx = \frac{(2x + 3)^3}{3 \times 2} + C$$

Think: what would you have to divide by to reverse chain rule.

$$\int (x + 2)^2 dx = \frac{(x + 2)^3}{3} + C$$

$$= \frac{x^3 + 3x^2(2) + 3x(2)^2 + 8}{3} + C$$

$$= \frac{x^3}{3} + 2x^2 + 4x + \frac{8}{3} + C$$