

Intro to Integration

We begin by viewing integration as the reverse process of differentiation.

$$\text{If } \frac{dy}{dx} = 3x^2 \text{ what could } y \text{ be}$$

$$y = x^3 + c$$

We can also write

$$\int 3x^2 dx = x^3 + c$$

$$\text{In general } \int x^n dx = \frac{x^{n+1}}{n+1} + c$$

for $n \neq -1$

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$$1 \text{ d) } \frac{dy}{dx} = -4x^{-3} \Rightarrow y = -\frac{4x^{-2}}{-2} + c$$

$$\underline{y = 2x^{-2} + c}$$

$$1 \text{ e) } \frac{dy}{dx} = x^{2/3} \Rightarrow y = \frac{x^{5/3}}{5/3} + c$$

$$y = \frac{3}{5} x^{5/3} + C$$

$$1f) \quad \frac{dy}{dx} = 4x^{1/2} \Rightarrow y = \frac{4x^{3/2}}{\frac{3}{2}} + C = \frac{8}{3} x^{3/2} + C$$

$$1j) \quad \frac{dy}{dx} = 6x^{1/3} \Rightarrow y = \frac{6x^{4/3}}{4/3} + C$$
$$y = \frac{9}{2} x^{4/3} + C$$

$$1k) \quad \frac{dy}{dx} = 36x^{11} \Rightarrow y = \frac{36x^{12}}{12} + C$$
$$y = 3x^{12} + C$$

$$1e) \quad \frac{dy}{dx} = -14x^{-8} \Rightarrow y = \frac{-14x^{-7}}{-7} + C$$
$$y = 2x^{-7} + C$$

$$1p) \quad \frac{dy}{dx} = 2x^{-0.4} \Rightarrow y = \frac{2x^{0.6}}{0.6} + C$$
$$y = \frac{10}{3} x^{0.6} + C$$

$$2c) \frac{dy}{dx} = 4 - 12x^{-4} + 2x^{-\frac{1}{2}}$$

$$\Rightarrow y = 4x - \frac{12x^{-3}}{-3} + \frac{2x^{\frac{1}{2}}}{\frac{1}{2}} + c$$

$$y = 4x + 4x^{-3} + 4x^{\frac{1}{2}} + c$$

$$2f) \frac{dy}{dx} = 5x^4 - x^{-\frac{3}{2}} - 12x^{-5}$$

$$\Rightarrow y = \frac{5x^5}{5} - \frac{x^{-\frac{1}{2}}}{-\frac{1}{2}} - \frac{12x^{-4}}{-4} + c$$

$$y = x^5 + 2x^{-\frac{1}{2}} + 3x^{-4} + c$$

$$3c) f'(x) = \frac{1}{2}x^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{3}{2}}$$

$$\Rightarrow f(x) = \frac{\frac{1}{2}x^{\frac{1}{2}}}{\frac{1}{2}} - \frac{\frac{1}{2}x^{-\frac{1}{2}}}{-\frac{1}{2}} + c$$

$$f(x) = x^{\frac{1}{2}} + x^{-\frac{1}{2}} + c$$

$$3f) f'(x) = 9x^2 + 4x^{-3} + \frac{1}{4}x^{-\frac{1}{2}}$$

$$\Rightarrow f(x) = \frac{9x^3}{3} + \frac{4x^{-2}}{-2} + \frac{\frac{1}{4}x^{\frac{1}{2}}}{\frac{1}{2}} + c$$

$$f(x) = 3x^3 - 2x^{-2} + \frac{1}{2}x^{\frac{1}{2}} + c$$

$$\begin{aligned} 5c) \quad & \int (pt^3 + q^2 + pr^3) dt \\ & = \frac{pt^4}{4} + q^2t + pr^3t + c \end{aligned}$$

Classwork and Homework

Exercise 13A Q2, Q3

Exercise 13B Q1, Q2, Q3, Q4, Q5