

# Integration of composite functions by recognition

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10:24 AM

\* Pre-requisite knowledge: Differentiation using Chain rule

## Some useful integration rules

$$\int a f(x) dx = a \int f(x) dx$$

e.g.  $\int 6x dx = \frac{6x^2}{2} + c = 3x^2 + c$

$$6 \times \boxed{\int x dx} = \boxed{\frac{x^2}{2} + c} \times 6$$

$$6 \int x dx = \frac{6x^2}{2} + 6c$$

$$6 \int x dx = 3x^2 + c$$

$$\int 6x dx = 6 \int x dx$$

$$\int a f(x) dx = a \int f(x) dx$$

$$\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$$

$$\int (6x^2 + 3x) dx = \int 6x^2 dx + \int 3x dx$$

### Integration

$$\int (3x+2)^2 dx = \frac{1}{9} (3x+2)^3 + c$$

$$\int 9(3x+2)^2 dx = (3x+2)^3 + c$$

$$9 \int (3x+2)^2 dx = (3x+2)^3 + c$$

$$\int x (3x+2)^2 dx = \frac{1}{9} (3x+2)^3 + c$$

### Differentiation

$$y = (3x+2)^3$$

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

$$\frac{dy}{dx} = 9(3x+2)^2$$

$$\text{if } u = \frac{1}{9}(3x+2)^3 + c$$

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

$$\frac{1}{9} \times 9 \int (3x+2)^2 dx = \frac{1}{9} \times [(3x+2)^3 + C]$$

$$\int (3x+2)^2 dx = \frac{1}{9} (3x+2)^3 + \cancel{C}$$

$$= \frac{1}{9} (3x+2)^3 + C$$

$$\text{if } y = \frac{1}{9} (3x+2)^3 + 25$$

$$\frac{dy}{dx} = 3 \times \frac{1}{9} (3x+2)^2 \times 3$$

$$= 3 \times 3 \times \frac{1}{9} \times (3x+2)^2$$

$$= \frac{9}{9} (3x+2)^2$$

$$= (3x+2)^2$$