Anti-differentiation

Differentiate $\quad y = 3x^2$

$$\frac{dy}{dx} = 6x$$

Antidifferentiate $\quad \frac{dy}{dx} = 6x$

$$y = ?$$

if $\dfrac{dy}{dx} = ax^n$ then $\quad y = \dfrac{ax^{n+1}}{n+1} + c \quad$ for $\quad n \neq -1$

$\boxed{\dfrac{dy}{dx} = 6x}$ $\qquad y = \dfrac{6x^{1+1}}{1+1} + c$

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

Solving a differential equation / anti-differentiate $\longrightarrow$ $\quad \boxed{y = 3x^2 + \boxed{C}}$

$$y = 3x^2 + 7 \qquad\qquad y = 3x^2 + 15$$
$$y' = 6x \qquad\qquad\qquad y' = 6x$$

$$\int 6x \, dx = 3x^2 + C$$

Practice questions:

① $\dfrac{dy}{dx} = 4x^1 \boxed{-3x^0}$

$\qquad y = ?$

$\dfrac{dy}{dx} = ax^n$

$y = \dfrac{ax^{n+1}}{n+1} + c$

$\qquad y = 4x^2 - 3x^1 + c$

② $\dfrac{dy}{dx} = \dfrac{3}{4}x$

$\qquad y = ?$

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

$y = \dfrac{3}{4}x^2 \times \dfrac{1}{2} + c$

③ $\int 4x^2 + 3x \, dx$

$= \dfrac{4x^3}{3} + \dfrac{3x^2}{2} + c$

$$y - \overline{n+1}$$

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

$$y = 2x^2 - 3x + c \checkmark$$

test: $\frac{dy}{dx} = 4x - 3$

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

$$y = \frac{3x^2}{8} + c \checkmark$$

$$\frac{dy}{dx} = \frac{6}{8}x$$

$$= \frac{3}{4}x$$