

Self Exercise 15

① $y = -2x$

$$\frac{dy}{dx} = -2$$

② $y = 4x^2$

$$\begin{aligned}\frac{dy}{dx} &= 4(2)x^{2-1} \\ &= 8x\end{aligned}$$

③ $y = -\frac{1}{x^2}$

$$\begin{aligned}&= -x^{-2} \\ \frac{dy}{dx} &= -(-2)x^{-2-1} \\ &= 2x^{-3} \\ &= 2\left(\frac{1}{x^3}\right) \\ &= \frac{2}{x^3}\end{aligned}$$

④ $y = 3x^2$

$$\begin{aligned}\frac{dy}{dx} &= 3(2)x^{2-1} \\ &= 6x\end{aligned}$$

⑤ $y = \frac{5}{x^4}$

$$\begin{aligned}&= 5\left(\frac{1}{x^4}\right) \\ &= 5x^{-4}\end{aligned}$$

$$\begin{aligned}\frac{dy}{dx} &= 5(-4)x^{-4-1} \\ &= -20x^{-5}\end{aligned}$$

$$\begin{aligned}\textcircled{6} y &= \sqrt{x} = x^{\frac{1}{2}} \\ \frac{dy}{dx} &= \frac{1}{2}x^{\frac{1}{2}-1} \\ &= \frac{1}{2}x^{-\frac{1}{2}} \\ &= \frac{1}{2\sqrt{x}}\end{aligned}$$

⑦ $y = -3x^{-3}$

$$\begin{aligned}\frac{dy}{dx} &= -3(-3)x^{-3-1} \\ &= 9x^{-4} = 9\left(\frac{1}{x^4}\right) = \frac{9}{x^4}\end{aligned}$$

⑧ $y = \frac{1}{6x^2} = \frac{1}{6}x^{-2}$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{6}(-2)x^{-2-1} \\ &= -\frac{1}{3}x^{-3} \\ &= -\frac{1}{3x^3}\end{aligned}$$

⑨ $y = \frac{1}{2}x^2$

$$\begin{aligned}\frac{dy}{dx} &= \frac{1}{2}(2)x^{2-1} \\ &= x\end{aligned}$$

⑩ $y = -\frac{2}{3x} = -\frac{2}{3}x^{-1}$

$$\begin{aligned}\frac{dy}{dx} &= -\frac{2}{3}(-1)x^{-1-1} \\ &= \frac{2}{3}x^{-2} \\ &= \frac{2}{3x^2}\end{aligned}$$