

Answers :

$$\begin{aligned}(1) \text{ (a) } \int (2x + 1)(x - 1)dx &= \int (2x^2 - 2x + x - 1)dx \\ &= \int (2x^2 - x - 1)dx \\ &= \frac{2x^3}{3} - \frac{x^2}{2} - x + c\end{aligned}$$

$$\begin{aligned}\text{(b) } \int \frac{\sqrt{x+1}}{\sqrt{x}} dx &= \int \left(1 + x^{-\frac{1}{2}}\right) dx \\ &= x + \frac{x^{-\frac{1}{2}+1}}{-\frac{1}{2}+1} + c \\ &= x + 2\sqrt{x} + c\end{aligned}$$

$$\begin{aligned}\text{(c) } \int \left(\frac{x^2+2}{x}\right)^2 dx &= \int \frac{x^4+4x^2+4}{x^2} dx \\ &= \int (x^2 + 4 + 4x^{-2}) dx \\ &= \frac{x^3}{3} + 4x + \frac{4x^{-1}}{-1} + c \\ &= \frac{x^3}{3} + 4x - \frac{4}{x} + c\end{aligned}$$

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

$$\begin{aligned}y &= \int (3x^2 + 2) dx \\ &= \frac{3x^3}{3} + 2x + c \\ &= x^3 + 2x + c\end{aligned}$$

Substituting (1, 4) into equation,

$$4 = 1^2 + 2(1) + c$$

$$c = 1$$

$$\therefore y = x^3 + 2x + 1$$