Chapter 9: Integration

Exercise 9f

(1) $\frac{dy}{dx} = 3x - 4 \Rightarrow y = \int 3x - 4\, dx$

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

we know the point $(1, 2)$, so $2 = \frac{3}{2} - 4 + c$

$\therefore c = 4\frac{1}{2}$

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

(2) $\frac{dy}{dx} = 3x^2 - 5x + 1 \Rightarrow y = x^3 - \frac{5}{2}x^2 + x + c$

But we know $(0, 3)$, so $3 = c$

$\therefore y = x^3 - \frac{5}{2}x^2 + x + 3$

(3) $\frac{dy}{dx} = 6e^{2x} \Rightarrow y = \int 6e^{2x}\, dx$

$= 3e^{2x} + c$ (by Substitution)

But we have $(0, 2)$, so $2 = 3e^0 + c \Rightarrow c = -1$

$\therefore y = 3e^{2x} - 1$.

(4) $\frac{dy}{dx} = (7-5x)^2 \Rightarrow y = \int (7-5x)^2 \, dx$

$= -\frac{1}{15}(7-5x)^3 + C$ (by substitution)

But we know $(1, \frac{7}{15})$, so $\frac{7}{15} = -\frac{1}{15}(7-5)^3 + C$

$= -\frac{8}{15} + C$

$\therefore C = 1$

So $y = -\frac{1}{15}(7-5x)^3 + 1$

(5) $\frac{dy}{dx} = \cos 3x \Rightarrow y = \int \cos 3x \, dx$

$= \frac{1}{3} \sin 3x + C$ (by substitution)

But we know $(\frac{\pi}{2}, 1)$, so $1 = \frac{1}{3} \sin \frac{3\pi}{2} + C$

$\therefore 1 = -\frac{1}{3} + C \Rightarrow C = 1\frac{1}{3}$

$\therefore y = \frac{1}{3} \sin 3x + 1\frac{1}{3}$

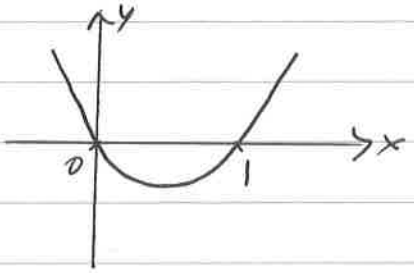
(6) $\frac{dy}{dx} = 2x - 1 \Rightarrow y = \int 2x - 1 \, dx$

$= x^2 - x + C$

But we know $(0, 0)$ $\therefore 0 = 0 - 0 + C \Rightarrow C = 0$

So $y = x^2 - x = x(x-1)$

Sketch



(7) $\frac{dy}{dx} = e^{3x} \Rightarrow y = \int e^{3x}\,dx$

$= \frac{1}{3}e^{3x} + c$

we know $(1, 2)$, so $2 = \frac{1}{3}e^{3} + c$

$\therefore c = 2 - \frac{1}{3}e^{3}$

$\therefore y = \frac{1}{3}e^{3x} + \left(2 - \frac{1}{3}e^{3}\right)$

when curve crosses y-axis, $x = 0$

$\therefore y = \frac{1}{3}e^{0} + 2 - \frac{1}{3}e^{3} = 2\frac{1}{3} - \frac{1}{3}e^{3}$

$= \frac{7 - e^{3}}{3}$

$\therefore$ coord is $\left(0, \frac{7-e^{3}}{3}\right)$.