Q1. (a)

$$\begin{aligned}\int_1^5 4x^3 dx &= (5)^4 - (1)^4 \\ &= 625 - 1 \\ &= 624\end{aligned}$$

(b)

$$\begin{aligned}\int_0^{\frac{\pi}{2}} (-\sin x) dx &= \cos\frac{\pi}{2} - \cos 0 \\ &= 0 - 1 \\ &= -1\end{aligned}$$

Q2.

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

Now, given $f(0) = 4$ solve for C

$$f(0) = e^0 + \frac{2}{3}(0)^3 + C$$
$$4 = 1 + 0 + C$$
$$3 = C$$

Q3. If $f'(x) = \frac{2}{x} + \frac{6}{x^2}$ find the particular solution of $f(x)$ is $f(1) = -7$

$$f(x) = \int \frac{2}{x} + \frac{6}{x^2} dx$$
$$= \int \frac{2}{x} dx + \int \frac{6}{x^2} dx$$
$$= 2 - 6x^{-1} + C$$

Q4. $\int 3\sec^2(x)$

$$f(x) = \int (3\sec^2 x) dx$$
$$= \tan x + C$$

Q5. $\int \frac{1}{\sqrt{1-x^2}} dx$

$$f(x) = \int \frac{1}{\sqrt{1-x^2}} dx$$
$$= \arcsin x + C$$