

## Definite Integrals Ex 20.3 Q15

We have.

$$I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left\{ \sin \left| x \right| + \cos \left| x \right| \right\} dx$$

Let  $f(x) = \sin |x| + \cos |x|$ 

Then, f(x) = f(-x)

f(x) is an even function.

So, 
$$I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left\{ \sin|x| + \cos|x| \right\} dx = 2 \int_{0}^{\frac{\pi}{2}} \left( \sin x + \cos x \right) dx = 2 \left[ \cos x + \sin x \right]_{0}^{\frac{\pi}{2}} = 4$$

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left\{ \sin \left| x \right| + \cos \left| x \right| \right\} dx = 4$$

Definite Integrals Ex 20.3 Q16

$$I = \int_0^4 |x-1| dx$$

It can be seen that,  $(x-1) \le 0$  when  $0 \le x \le 1$  and  $(x-1) \ge 0$  when  $1 \le x \le 4$ 

$$I = \int_{0}^{1} |x - 1| dx + \int_{1}^{4} |x - 1| dx \qquad \left( \int_{x}^{6} f(x) = \int_{x}^{6} f(x) + \int_{6}^{6} f(x) \right)$$

$$= \int_{0}^{1} -(x - 1) dx + \int_{1}^{4} (x - 1) dx \qquad \left( \int_{x}^{6} f(x) = \int_{x}^{6} f(x) + \int_{6}^{6} f(x) \right)$$

$$= \left[ x - \frac{x^{2}}{2} \right]_{0}^{1} + \left[ \frac{x^{2}}{2} - x \right]_{1}^{4}$$

$$= 1 - \frac{1}{2} + \frac{(4)^{2}}{2} - 4 - \frac{1}{2} + 1$$

$$= 1 - \frac{1}{2} + 8 - 4 - \frac{1}{2} + 1$$

$$= 5$$

Definite Integrals Ex 20.3 Q17

Let 
$$I = \int_{1}^{4} \{|x - 1| + |x - 2| + |x - 4|\} dx$$
  

$$= \int_{1}^{2} \{(x - 1) - (x - 2) - (x - 4)\} dx + \int_{2}^{4} \{(x - 1) + (x - 2) - (x - 4)\} dx$$

$$= \int_{1}^{2} \{(x - 1 - x + 2 - x + 4)\} dx + \int_{2}^{4} \{(x - 1 + x - 2 - x + 4)\} dx$$

$$= \int_{1}^{2} (5 - x) dx + \int_{2}^{4} (x + 1) dx$$

$$= \left[ 5x - \frac{x^{2}}{2} \right]_{1}^{2} + \left[ \frac{x^{2}}{2} + x \right]_{2}^{4}$$

$$= \left[ 10 - 2 - 5 + \frac{1}{2} \right] + \left[ 8 + 4 - 2 - 2 \right]$$

$$= \frac{7}{2} + 8$$

$$I = \frac{23}{2}$$

Definite Integrals Ex 20.3 Q18

We have,
$$I = \int_{-5}^{0} (|x| + |x + 2| + |x + 5|) dx = \int_{-5}^{0} |x| dx + \int_{-5}^{0} |x + 2| dx + \int_{-5}^{0} |x + 5| dx$$

$$\Rightarrow I = \int_{-5}^{0} -x dx + \int_{-5}^{-2} -(x + 2) dx + \int_{-2}^{0} (x + 2) dx + \int_{-5}^{0} (x + 5) dx$$

$$= \left[ \frac{-x^2}{2} \right]_{-5}^{0} + \left[ \frac{-x^2}{2} - 2x \right]_{-5}^{-2} + \left[ \frac{x^2}{2} + 2x \right]_{-2}^{0} + \left[ \frac{x^2}{2} + 5x \right]_{-5}^{0}$$

$$= \left[ + \frac{25}{2} \right] - \left[ \frac{4}{2} - 4 - \frac{25}{2} + 10 \right] + \left[ 0 + 0 - \frac{4}{2} + 4 \right] + \left[ 0 + 0 - \frac{25}{2} + 25 \right]$$

$$= \frac{25}{2} - \left[ 8 - \frac{25}{2} \right] + \left[ 2 \right] + \left[ 25 - \frac{25}{2} \right]$$

$$= \frac{25}{2} - 8 + \frac{25}{2} + 2 + 25 - \frac{25}{2}$$

$$= 19 + \frac{25}{2} = 31\frac{1}{2}$$

$$I = \frac{63}{2}$$

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