

Definite Integrals Ex 20.3 Q7

$$\int_{0}^{3} |3x - 1| dx = \int_{0}^{\frac{1}{3}} - (3x - 1) dx + \int_{\frac{1}{3}}^{3} (3x - 1) dx$$

$$= -\left[\frac{3x^{2}}{2} - x\right]_{0}^{\frac{1}{3}} + \left[\frac{3x^{2}}{2} - x\right]_{\frac{1}{3}}^{3}$$

$$= -\left[\left(\frac{3}{9 \times 2} - \frac{1}{3}\right) - (0)\right] + \left[\left(\frac{3 \times 9}{2} - 3\right) - \left(\frac{3}{9 \times 2} - \frac{1}{3}\right)\right]$$

$$= -\left[\left(\frac{1}{6} - \frac{1}{3}\right)\right] + \left[\left(\frac{27}{2} - 3\right) - \left(\frac{1}{6} - \frac{1}{3}\right)\right]$$

$$= -\left[\left(-\frac{1}{6}\right)\right] + \left[\left(10\frac{1}{2}\right) - \left(-\frac{1}{6}\right)\right]$$

$$= -\left[\left(-\frac{1}{6}\right)\right] + \left[10\frac{1}{2} + \frac{1}{6}\right]$$

$$= \frac{1}{6} + 10\frac{1}{2} + \frac{1}{6}$$

$$= \frac{1}{3} + \frac{21}{2} = \frac{2 + 63}{6} = \frac{65}{6}$$

$$= \frac{65}{6}$$

$$\int_{0}^{3} |3x - 1| dx = \frac{65}{6}$$

Definite Integrals Ex 20.3 Q8

$$\int_{-6}^{6} |x + 2| dx$$

$$= \int_{-6}^{-2} -(x + 2) dx + \int_{-2}^{6} (x + 2) dx$$

$$= -\left[\frac{x^{2}}{2} + 2x\right]_{-6}^{-2} + \left[\frac{x^{2}}{2} + 2x\right]_{-2}^{6}$$

$$= -\left[\left(\frac{4}{2} + 2\left(\frac{12}{2}\right)\right) - \left(\frac{36}{2} - 12\right)\right] + \left[\left(\frac{36}{2} + 12\right) - \left(\frac{4}{2} - 4\right)\right]$$

$$= -\left[(2 - 4) - (18 - 12)\right] + \left[(18 + 12) - (2 - 4)\right]$$

$$= -\left[-8\right] + \left[30 + 2\right]$$

$$= 8 + 32$$

$$= 40$$

$$\therefore \int_{-6}^{6} |x + 2| dx = 40$$

Definite Integrals Ex 20.3 Q9

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

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

$$= -\left[\left(\frac{1}{2} - 1\right) - \left(\frac{4}{2} - 2\right)\right] + \left[\left(\frac{4}{2} + 2\right) - \left(\frac{1}{2} - 1\right)\right]$$

$$= -\left[\left(-\frac{1}{2}\right) - 0\right] + \left[4 + \frac{1}{2}\right]$$

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

$$\therefore \int_{-2}^{2} |x+1| dx = 5$$

Definite Integrals Ex 20.3 Q10

$$\int_{1}^{2} |x - 3| dx = \int_{1}^{2} - (x - 3) dx \qquad [x - 3 < 0 \text{ for } 1 > x > 2]$$

$$= -\left[\frac{x^{2}}{2} - 3x\right]_{1}^{2}$$

$$= -\left[\left(\frac{4}{2} - 6\right) - \left(\frac{1}{2} - 3\right)\right]$$

$$= -\left[\left(-4\right) - \left(-2\frac{1}{2}\right)\right]$$

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

$$= -\left[-\frac{3}{2}\right]$$

$$= \frac{3}{2}$$

$$\therefore \int_{1}^{2} |x - 3| dx = \frac{3}{2}$$

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