Definite Integrals Ex 20.3 Q7

$$\int_0^3 |3x-1|dx = \int_0^{\frac{1}{3}} -(3x-1)\,dx + \int_{\frac{1}{3}}^3 (3x-1)\,dx$$

$$= -\left[\frac{3x^2}{2}-x\right]_0^{\frac{1}{3}} + \left[\frac{3x^2}{2}-x\right]_{\frac{1}{3}}^3$$

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

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

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

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

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

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

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

$$\therefore \int_0^3 |3x-1|dx = \frac{65}{6}$$

Definite Integrals Ex 20.3 Q8

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

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

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

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

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

$$=-[-8]+[30+2]$$

$$=8+32$$

$$=40$$

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

Definite Integrals Ex 20.3 Q9

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

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

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

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

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

$$=5$$

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

Definite Integrals Ex 20.3 Q10

$$\int_1^2 |x-3|\,dx = \int_1^2 -(x-3)\,dx \qquad [x-3<0 \text{ for } 1>x>2]$$

$$= -\left[\frac{x^2}{2}-3x\right]_1^2$$

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

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

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

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

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

$$\therefore \int_1^2 |x-3|\,dx = \frac{3}{2}$$

********** END **********