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$$S \int_8^{12} (x+8) dx$$

$$\frac{x^2}{2} + 8x \Big|_8^{12} = \left(\frac{12^2}{2} + 8(12) \right) - \left(\frac{8^2}{2} + 8(8) \right)$$

$$= 168 - 96$$

$$= 72$$

$$1) \int_{-2}^2 x^2 dx = \left. \frac{x^3}{3} \right|_{-2}^2 = \frac{2^3}{3} - \frac{-2^3}{3}$$

$$= \frac{8}{3} - \frac{-8}{3} = \frac{8}{3} + \frac{8}{3} = \frac{16}{3}$$

$$2) \int_{-3}^3 \frac{2x^3 + 3x}{3} dx = \left[\frac{2}{3} \cdot \frac{x^4}{4} + \frac{3}{2} x^2 \right]_{-3}^3$$

$$= \left[\frac{2}{3} \cdot \frac{3^4}{4} + \frac{3}{2} \cdot 3^2 \right] - \left[\frac{2}{3} \cdot \frac{(-3)^4}{4} + \frac{3}{2} \cdot (-3)^2 \right]$$

$$= \left[\frac{2}{3} \cdot \frac{81}{4} + \frac{3}{2} \cdot 9 \right] - \left[\frac{2}{3} \cdot \frac{81}{4} + \frac{3}{2} \cdot 9 \right]$$

$$= \left[\frac{162}{12} + \frac{27}{2} \right] - \left[\frac{162}{12} + \frac{27}{2} \right]$$

$$= \frac{162}{12} + \frac{162}{12} - \frac{162}{12} - \frac{162}{12} = 0$$

$$3) \int_{-3}^3 x^5 (x^4 - x^2) dx = \left[\frac{1}{6} x^6 (x^4 - x^2) \right]_{-3}^3$$

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

$$= \left[\frac{1}{6} (729) (81 - 9) \right] - \left[\frac{1}{6} (729) (81 - 9) \right]$$

$$= \left[\frac{1}{6} (729) (72) \right] - \left[\frac{1}{6} (729) (72) \right]$$

$$= 17496 - 17496 = 0$$