

$$1) f(x) = g(x) \Leftrightarrow x^2 = 8 - x^2$$

$$\Leftrightarrow 2x^2 = 8$$

$$\Leftrightarrow x^2 = 4$$

$$\Leftrightarrow x = \pm 2$$

$$\begin{aligned} f(x) - g(x) &= x^2 - (8 - x^2) = x^2 - 8 + x^2 \\ &= 2x^2 - 8 \end{aligned}$$

$$\left| \int_{-2}^2 (f(x) - g(x)) dx \right| = \left| \left(\frac{2}{3} x^3 - 8x \right) \right|_{-2}^2$$

$$= \left| \left(\frac{2}{3} \cdot 8 - 16 \right) - \left(\frac{2}{3} (-8) - 8(-2) \right) \right|$$

$$= \left| \frac{16}{3} - 16 + \frac{16}{3} - 16 \right|$$

$$= \left| \frac{32}{3} - 32 \right| = \left| -\frac{64}{3} \right| = \frac{64}{3}$$

$$2) f(x) = g(x) \Leftrightarrow x^3 - 5x^2 + 6x = x^3 - 7x^2 + 12x$$

$$\Leftrightarrow 2x^2 - 6x = 0$$

$$\Leftrightarrow 2x(x-3) = 0 \Leftrightarrow \begin{matrix} x=0 \\ x=3 \end{matrix}$$

$$\begin{aligned} f(x) - g(x) &= x^3 - 5x^2 + 6x - (x^3 - 7x^2 + 12x) \\ &= 2x^2 - 6x \end{aligned}$$

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

$$\left| \int_0^3 (2x^2 - 6x) dx \right| = \left| \left(\frac{2}{3}x^3 - 3x^2 \right) \right|_0^3$$

$$= \left| \frac{2}{3} \cdot 27 - 27 - 0 \right|$$

$$= |18 - 27| = |-9| = 9$$