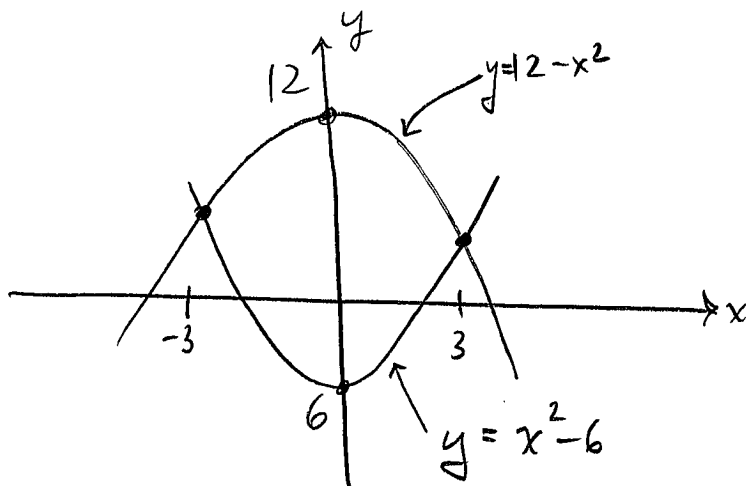


(1) [7] Determine the area enclosed by the curves $y = 12 - x^2$ and $y = x^2 - 6$.



$$12 - x^2 = x^2 - 6$$

$$2x^2 = 18$$

$$x^2 = 9$$

$$x = 3, -3.$$

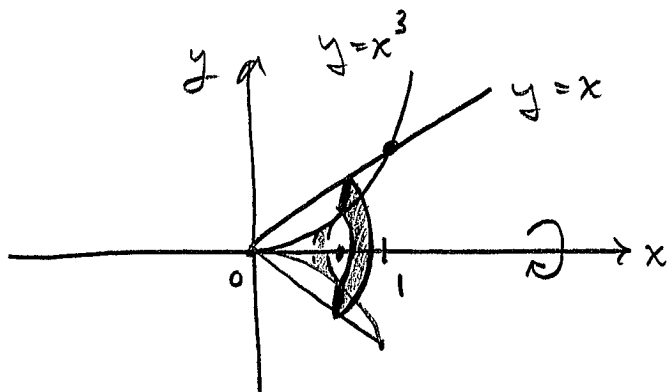
$$A = \int_{-3}^3 (12 - x^2) - (x^2 - 6) dx$$

$$= 2 \int_0^3 18 - 2x^2 dx$$

$$= 2 \left[18x - \frac{2x^3}{3} \right]_0^3$$

$$= 2 [54 - 18] = \boxed{72}$$

(2) [8] The region in the first quadrant bounded by $y = x^3$ and $y = x$ is rotated about the x -axis. Determine the volume of the resulting solid.



$$A(x) = \pi x^2 - \pi (x^3)^2$$

$$\therefore V = \int_0^1 (\pi x^2 - \pi x^6) dx$$

$$= \pi \left[\frac{x^3}{3} - \frac{x^7}{7} \right]_0^1$$

$$= \pi \left(\frac{1}{3} - \frac{1}{7} \right)$$

$$= \pi \left(\frac{4}{21} \right)$$

$$= \boxed{\frac{4\pi}{21}}$$