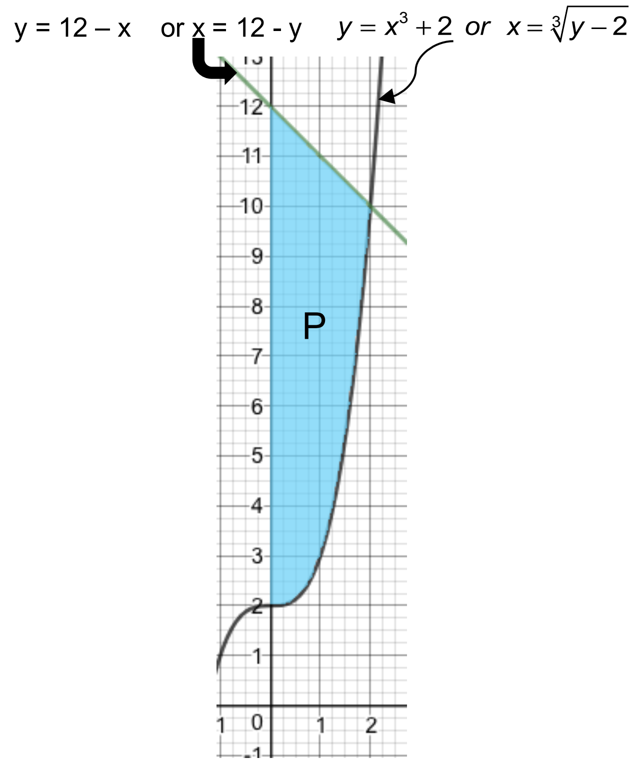
Region P is bounded by the y-axis, y = 12 – x and $y = x^3 + 2$



Area of P – vertical slices

$$A = \int_0^2 (12 - x - (x^3 + 2))\,dx$$

Area of P – horizontal slices

$$A = \int_2^{10} \sqrt[3]{y-2}\,dy + \int_{10}^{12} (12 - y)\,dy$$

Volume of P around x-axis – vertical slices

$$V = \pi \int_0^2 ((12 - x)^2 - (x^3 + 2)^2)\,dx$$

Volume of P around y-axis – vertical slices

$$V = 2\pi \int_0^2 x(12 - x - (x^3 + 2))\,dx$$

Volume of P around x-axis – horizontal slices

$$V = 2\pi \int_2^{10} y \bullet \sqrt[3]{y-2}\,dy + 2\pi \int_{10}^{12} y(12 - y)\,dy$$

Volume of P around y-axis – horizontal slices

$$V = \pi \int_2^{10} (\sqrt[3]{y-2})^2\,dy + \pi \int_{10}^{12} (12 - y)^2\,dy$$

Length of Boundary of P – vertical slices

$$L = 12 + \int_0^2 \sqrt{1 + (3x^2)^2}\,dx + \int_0^2 \sqrt{1 + (-1)^2}\,dx$$

Volume if Cross-Sections Perpendicular to x-axis are squares

$$V = \int_0^2 (12 - x - (x^3 + 2))^2\,dx$$

Volume if Cross-Sections Perpendicular to x-axis equilateral triangles, isosceles right triangles, semi-Cir

$$V_{eq\Delta} = \frac{\sqrt{3}}{4} \int_0^2 (12 - x - (x^3 + 2))^2\,dx, \quad V_{isosRT} = \frac{1}{4} \int_0^2 (12 - x - (x^3 + 2))^2\,dx, \quad V_{semi-C} = \frac{\pi}{8} \int_0^2 (12 - x - (x^3 + 2))^2\,dx$$

Volume if Cross-Sections Perpendicular to y-axis are squares

$$V = \int_2^{10} (\sqrt[3]{y-2})^2\,dy + \int_{10}^{12} (12 - y)^2\,dy$$