Revolution About the x-axis

Find the volume of the solid of revolution generated by rotating the regions bounded by the curves given around the x-axis.

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12/8/25

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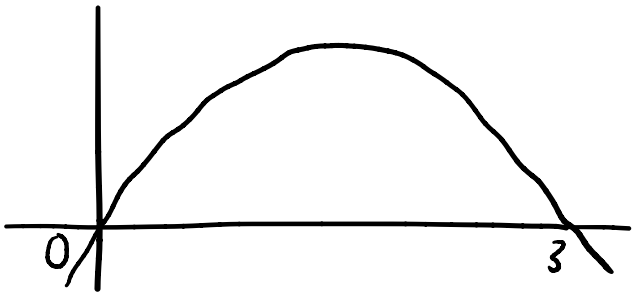
$y = x(3-x)$



$$\int_0^3 \pi y^2 \, dx$$

$$= \int_0^3 \pi (3x - x^2)^2 dx$$

$$= \pi \int_0^3 x^4 - 6x^3 + 9x^2 \, dx$$

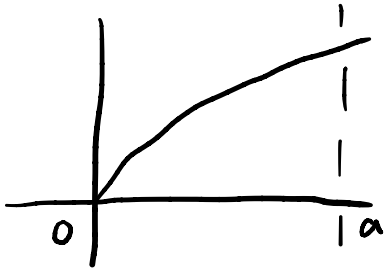
$$= \pi \left(\frac{x^5}{5} - \frac{6x^4}{4} + \frac{9x^3}{3} \right) \Big|_0^3$$

$$= \pi \left(\frac{243}{5} - \frac{243}{2} + \frac{243}{3} \right)$$

$$= \pi \left(\frac{6 \cdot 243 - 15 \cdot 243 + 10 \cdot 243}{30} \right)$$

$$= \frac{81}{10} \pi$$

b) $y = \sqrt{ax}$, $y = 0$, $x = a$



$$\int_0^a \pi \left(\sqrt{ax}\right)^2 dx$$

$$= \pi a \left(\frac{x^2}{2} \right) \Big|_0^a$$

$$= \pi a \left(\frac{a^2}{2} \right)$$

$$= \frac{\pi}{2} a^3$$