Work carefully and neatly. You must show all relevant work! You may receive no credit if there is insufficient work. Graphing calculators are not allowed!

[5] 1. Sketch the region enclosed by the curves \( y = x^2 + 1, y = 3 - x^2, x = 0, x = 2 \). Then find the area of the region.

\[ x^2 + 1 = 3 - x^2 \\
2x^2 = 2 \\
x^2 = 1 \\
x = \pm 1 \text{ on interval} \]

\[ \int_0^1 [(3-x^2) - (x^2+1)] \, dx - \int_1^2 [(x^2+1) - (3-x^2)] \, dx \]

\[ = \int_0^1 (2-2x^2) \, dx + \int_1^2 (2x^2-2) \, dx \]

\[ = 2x - \frac{2}{3}x^3 \bigg|_0^1 + \frac{2}{3}x^3 - 2x \bigg|_1^2 \]

\[ = (2 - \frac{2}{3}) - 0 + \left(\frac{16}{3} - 4\right) - \left(\frac{2}{3} - 2\right) \]

\[ = 2 - \frac{2}{3} + \frac{14}{3} - \frac{2}{3} - 4 \]

\[ = \frac{2}{3} - \frac{4}{3} = \frac{12}{3} = 4 \]

[5] 2. The region bounded by the curves \( y = x^{2/3}, y = 1 \) and \( x = 0 \) is revolved around the y-axis. What is the volume of the solid?

\[ \pi \int_0^1 y \, dy = \pi \int_0^1 x^2 \, dy \]

\[ y = x^{2/3} \]

\[ y^{3/2} = x \]

\[ y^3 = x^2 \]

So \( \pi x^2 \, dy = \pi y^3 \, dy \)

\[ \pi \int_0^1 y^3 \, dy = \frac{1}{4} \pi y^4 \bigg|_0^1 = \frac{1}{4} \pi \]

\[ \square \]