1. **SET UP** the integral to find the arc length of the curve \( f(x) = x^3 \) over the interval \([0, 2]\).

\[
\frac{f'(x)}{x} = 3x^2
\]

\[
\left[ f'(x) \right]^2 = (3x^2)^2 = 9x^4
\]

\[
S = \int_0^2 \sqrt{1 + 9x^4} \, dx
\]

2. **SET UP** the integral to find the area of the surface formed by rotating the graph of the curve \( f(x) = \frac{1}{2}x^2 \) over \([0, \sqrt{3}]\) about the y-axis.

\[
\frac{f'(x)}{x} = \frac{x}{\sqrt{3}}
\]

\[
\left[ f'(x) \right]^2 = \frac{x^2}{3}
\]

\[
S = 2\pi \int_0^{\sqrt{3}} x \sqrt{1 + \frac{x^2}{3}} \, dx
\]

**BONUS: NO EXTRA TIME:** Find the area to #2, that is what is the area of the surface?

\[
S = 2\pi \int_0^{\sqrt{3}} \frac{u^{\frac{3}{2}}}{2} \, du = \int_0^{\sqrt{3}} u^{\frac{3}{2}} \, du
\]

\[
= \frac{2\pi}{3} \left[ (x^2 + 1)^{\frac{3}{2}} \right]_0^\sqrt{3}
\]

\[
= \frac{2\pi}{3} \left[ 4^{\frac{3}{2}} - 1^{\frac{3}{2}} \right] = \frac{14\pi}{3} \text{ units}^2
\]