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

$$f'(x) = 3x^2$$
$$\left[f'(x)\right]^2 = (3x^2)^2 = 9x^4$$
$$s = \int_0^2 \sqrt{1 + 9x^4} \, dx$$

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

$$f'(x) = x^{-\frac{1}{2}}$$
$$\left[f'(x)\right]^2 = (x^{-\frac{1}{2}})^2 = x^{-1}$$
$$s = 2\pi \int_0^3 2\sqrt{x}\sqrt{1 + \frac{1}{x}} \, dx$$

or

$$s = 4\pi \int_0^3 \sqrt{x}\sqrt{\frac{x+1}{x}} \, dx$$

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

$$s = 4\pi \int_0^3 \frac{\sqrt{x+1}}{\sqrt{x}} \, dx$$

$$s = 4\pi \left[\frac{2}{3} \left(x+1\right)^{\frac{3}{2}}\right]_0^3$$

$$s = 8\pi \left[4^{3/2} - 1^{3/2}\right]$$

$$s = \frac{56\pi}{3} \text{ units}^2$$