

§ 8.2 #5 Find the area of the surface by rot. curve ~~of~~ about x-axis

$$y = x^3, \quad 0 \leq x \leq 2$$

$$A = \int 2\pi y \, ds$$

$$ds = \sqrt{1 + (y')^2} \, dx$$

$$y' = 3x^2$$

$$A = \int_0^2 2\pi x^3 \sqrt{1 + (3x^2)^2} \, dx$$

$$= \int_0^2 2\pi x^3 \sqrt{1 + 9x^4} \, dx$$

$$u = 1 + 9x^4$$

$$du = 36x^3 \, dx$$

$$\frac{1}{36} du = x^3 \, dx$$

$$= (2\pi) \left(\frac{1}{36} \right) \int_1^{145} u^{1/2} \, du$$

$$= \frac{\pi}{18} \left[\frac{u^{3/2}}{3/2} \right]_1^{145}$$

$$= \frac{\pi}{18} \cdot \frac{2}{3} \left[(145)^{3/2} - (1)^{3/2} \right]$$

$$= \frac{\pi}{27} \left[145\sqrt{145} - 1 \right]$$

$$\begin{array}{r} 516 \\ 9 \\ \hline 144 \\ +1 \\ \hline 145 \end{array}$$

$$x=0$$

$$u=1$$

$$x=2$$

$$u=145$$