Directions: This quiz is Due by the start of class on Wednesday February 24th. To receive maximal credit, show all your work.

1) Sketch the arc of the curve \( y = x^{1/3} - 4 \) for \( 0 \leq x \leq 4 \).

\[
\begin{align*}
&u = x, \quad v = (x-4)^{1/3} \\
u' = 1, \quad v' = \frac{1}{3}(x-4)^{-2/3} \\
y' = u'v + v'u = (x-4)^{1/3} + \frac{x}{3(x-4)^{2/3}} \\
&= \frac{3(x-4)+x}{3(x-4)^{2/3}} = \frac{4(x-3)}{3(x-4)^{2/3}}
\end{align*}
\]

2) Set up BUT DO NOT EVALUATE the integral whose value is the length of this arc.

Arc length is

\[
L = \int_{a}^{b} \sqrt{1 + \left( \frac{dy}{dx} \right)^2} \, dx
\]

\[
= \int_{0}^{3} \sqrt{1 + \left( \frac{4(x-3)}{3(x-4)^{2/3}} \right)^2} \, dx
\]

3) Set up BUT DO NOT EVALUATE the integral whose value is the surface area of the solid obtained by revolving this arc about the x-axis

Surface Area is

\[
A = \int_{a}^{b} 2\pi R \sqrt{1 + \left( \frac{dy}{dx} \right)^2} \, dx
\]

\[
= \int_{0}^{3} 2\pi \left(-f(x)\right) \sqrt{1 + \left( \frac{4(x-3)}{3(x-4)^{2/3}} \right)^2} \, dx
\]

Radius for Revolution about x-axis is \( f(x) \)