PRINT Your Name:_____

The quiz is worth 5 points. **Remove EVERYTHING from your desk except this quiz and a pen or pencil.** SHOW your work. Express your work in a neat and coherent manner. $\boxed{\text{BOX}}$ your answer. **Check your answer**

Solve the initial value problem $2y\frac{dy}{dx} = \frac{x}{\sqrt{x^2-16}}$, $y(5) = 2$.
    Express your answer in the form $y = y(x)$ **.**

ANSWER: Multiply both sides by dx and integrate: $\int 2y\,dy = \int \frac{x}{\sqrt{x^2-16}}dx$ to obtain

$$y^2 = \sqrt{x^2 - 16} + C.$$

Plug in $y(5) = 2$ to see that $4 = \sqrt{25 - 16} + C$; that is, $4 = 3 + C$ or $1 = C$. Thus,

$$y^2 = \sqrt{x^2 - 16} + 1.$$

We solve for y to learn that

$$y = \pm\sqrt{\sqrt{x^2 - 16} + 1}.$$

However, y is sometimes positive; so, $\boxed{y = \sqrt{\sqrt{x^2 - 16} + 1}}$.

Check: Plug in $x = 5$ to get $y = \sqrt{\sqrt{25 - 16} + 1} = \sqrt{3 + 1} = 2$, as desired. Now we take the derivative

$$2y\frac{dy}{dx} = 2\sqrt{\sqrt{x^2 - 16} + 1}\frac{\frac{2x}{2\sqrt{x^2-16}}}{2\sqrt{\sqrt{x^2 - 16} + 1}} = \frac{x}{\sqrt{x^2 - 16}},$$

as desired. ✓