

Please PRINT your name _____

No calculators, cell phones, computers, notes, etc.

Circle your answer. Make your work correct, complete and coherent.

The quiz is worth 5 points. The solutions will be posted on my website later today.

Quiz 1, January 25, 2021

Solve the Initial Value Problem

$$\frac{dy}{dx} = x\sqrt{x^2 + 9} \quad y(-4) = 0.$$

ANSWER: We integrate to see that $y = \int x\sqrt{x^2 + 9} dx$. Substitute. Let $u = x^2 + 9$. It follows that $du = 2x dx$. Thus

$$y = \frac{1}{2} \int u^{1/2} du = \frac{1}{2} \cdot \frac{2}{3} u^{3/2} + C = \frac{1}{3} (x^2 + 9)^{3/2} + C.$$

We must choose C so that

$$0 = y(-4) = \frac{1}{3} ((-4)^2 + 9)^{3/2} + C = \frac{125}{3} + C.$$

Thus, $C = -\frac{125}{3}$ and

$$y = \frac{(x^2 + 9)^{3/2} - 125}{3}.$$

Check. The proposed answer satisfies the DE because

$$y' = \frac{1}{3} \cdot \frac{3}{2} (x^2 + 9)^{1/2} \cdot 2x = x\sqrt{x^2 + 9}. \checkmark$$

The proposed answer satisfies the Initial Condition because

$$y(-4) = \frac{((-4)^2 + 9)^{3/2} - 125}{3} = \frac{(25)^{3/2} - 125}{3} = 0. \checkmark$$