Please PRINT your name _____

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

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

Please take a picture of your quiz (for your records) just before you turn the quiz in. I will e-mail your grade and my comments to you. I will keep your quiz.

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

Quiz 1, September 6, 2023

Solve the Initial Value Problem

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

Check that your answer is correct.

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

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

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

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

Check. The proposed answer satisfies the DE because

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

The proposed answer satisfies the Initial Condition because

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