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.

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

Quiz 1, January 17, 2024

Substitute $y = e^{rx}$ into the Differential Equation $3y'' + 3y' - 4y = 0$ to determine all values of the constant r for which $y = e^{rx}$ is a solution of the Differential Equation.

Answer: We calculate $y' = re^{rx}$ and $y'' = r^2e^{rx}$. When we put y, y', and y'' into the differential equation we obtain

$$3r^2e^{rx} + 3re^{rx} - 4e^{rx} = 0.$$

Factor to obtain

$$e^{rx}(3r^2 + 3r - 4) = 0.$$

If a product is equal to zero, then one of the factors must be zero. The factor e^{rx} is never zero; so, $3r^2 + 3r - 4 = 0$. We use the quadratic formula: If $ax^2 + bx + c = 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

In our problem, $a = 3$, $b = 3$, and $c = -4$; Thus,

$$r = \frac{-3 \pm \sqrt{9 - 4(3)(-4)}}{2(3)}.$$

In other words,

$$\boxed{r = \frac{-3 \pm \sqrt{57}}{6}.}$$