MATH 308 – MIDTERM 1

Name		
Student ID		
Section	509	512
Signature		

Instructions: Welcome to your Midterm! You have 75 minutes to take this exam, for a total of 50 points. No books, notes, calculators, or cellphones are allowed. Remember that you are not only graded on your final answer, but also on your work. **Please put your answers in the boxes provided.** If you need to continue your work on a scratch paper, please check the box "Work on Scratch Paper," or else your work will be discarded. **Unless otherwise specified, write solutions in explicit form**

Academic Honesty Statement: With the signature above, I certify that the exam was taken by the person named and without any form of assistance and acknowledge that any form of cheating (no matter how small) results in an automatic F in the course, and will be further subject to disciplinary consequences, pursuant to the Aggie Honor Code.

Date: Monday, February 21, 2022.

1. *(8 points)* Solve the following differential equation:

$$\begin{cases} y'' - 3y' - 4y = 0 \\ y(0) = -5 \\ y'(0) = 15 \end{cases}$$

$y =$	

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2. *(8 points)* Solve the following differential equation

$$\begin{cases} t^2y' - y = 2t^3e^{-\frac{1}{t}} \\ y(1) = 0 \end{cases}$$

$y =$

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3. *(8 points)* Solve the following differential equation

$$\begin{cases} x + 3y^2\sqrt{x^2+1}\left(\dfrac{dy}{dx}\right) = 0 \\ y(0) = 2 \end{cases}$$

y =	

4. *(8 points)* Solve the following differential equation

$$\begin{cases} \dfrac{dy}{dx} = -\left(\dfrac{2xy + y^2}{x^2 + 2xy}\right) \\ y(2) = 1 \end{cases}$$

Note: Leave your answer in implicit form

Answer:	

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5. *(8 points)* Solve the following differential equation

$$\begin{cases} y' = 2y\left(1 - \dfrac{y}{4}\right) \\ y(0) = 2 \end{cases}$$

$y =$

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6. *(10 = 3 + 5 + 2 points)* Consider the following ODE:

$$t^2y'' - 4ty' + 4y = 0$$

(a) Use Abel's Formula to find the Wronskian $W(t)$

(b) Suppose one solution is $f(t) = t$ (do not check). Find another solution $g(t)$ (that is not a multiple of $f(t)$)

(c) Find the general solution y of the ODE above

$W(t) =$	
$g(t) =$	
$y =$	

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(Scratch paper)