APMA 0350 – MIDTERM 1

Name	
Brown ID	
Signature	

Note: Please use your Brown ID from your card, **NOT** the Banner ID

Instructions: Welcome to your midterm. You have 50 minutes to take this exam, for a total of 25 points. No books, notes, calculators, cheat sheets, or cellphones are allowed. **Please put your answers in the boxes provided.** Remember that you are not only graded on your final answer, but also on your work. If you need to continue your work on scratch paper, please check the box "Work on scratch paper"

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 results in an automatic F in the course, and will be further subject to disciplinary consequences, pursuant to the Brown University Academic Code.

Date: Friday, March 3, 2023.

1. *(5 points)* Solve the ODE and write your answer in explicit form

$$\begin{cases} y' = te^{2y} \\ y(0) = -1 \end{cases}$$

$y =$

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2. *(5 points)* Solve the ODE and write your answer in explicit form. Assume here $-\frac{\pi}{2} < t < \frac{\pi}{2}$

$$\begin{cases} \cos(t)\,(y') + y\sin(t) = \sin(t)\cos(t) \\ \quad y(0) = 3 \end{cases}$$

$y =$

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3. *(5 points)* Find the value of k for which this ODE is exact, and solve the ODE with that value of k. Leave your answer in implicit form.

$$\left(6y^3x + \cos(y)\right) dx + \left(k\, x^2y^2 - x\sin(y)\right) dy = 0$$

Answer:	

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4. *(5 points)* Dr. Peyam is baking a delicious pizza (pie) in a room whose ambient temperature is $1^\circ C$

   According to Papa John's Law of Heating, the rate of change of the pizza's temperature is proportional to the *sum* of that temperature and the ambient temperature.

   Suppose the initial temperature is $5^\circ C$ and, after one minute, the temperature is $11^\circ C$ How long does it take for the pizza's temperature to reach $23^\circ C$? Simplify your answer.

$t =$	

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5. *(5 points)* Solve the second-order ODE

$$\begin{cases} y'' - 7y' + 10y = 0 \\ y(0) = 6 \\ y'(0) = 9 \end{cases}$$

Note: You can do this directly, without differential operators

$y =$

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