Math 45, Fall 2020
September 16, Quiz 03 Name: _____

Please show and explain your work where necessary. Good luck!!

1. (*3 points*)

(i) Is the function e^x a solution to the differential equation $y' - y = 0$? (Circle your answer.)

Yes No

(ii) Circle the following that is most likely to be a trivial solution to a DE.

$y = e^x$ $y = c$ $y = 0$ $y = Ce^x$

(iii) Circle the following that is most likely to be a particular solution to a DE. (C, c_1, c_2, k are arbitrary constants.)

$y = e^x$ $y = c$ $y = c_1x + c_2xe^x$ $y = Ce^x$

(iv) Circle the following that is most likely to be a 2-parameter family of solutions to a DE. (C, c_1, c_2, k are arbitrary constants.)

$y = e^x$ $y = c$ $y = c_1x + c_2xe^x$ $y = Ce^x$

(v) Circle the following that is most likely to be a general solution to a DE. (C, c_1, c_2, k are arbitrary constants.)

$y = e^x$ $y = 0$ $y = c_1x + c_2xe^x$ $y = \cos(x)$

(vi) Suppose $y = \ln(x - 3)$ is a solution to a DE. Circle the following which would best represent its interval of validity (or domain of the solution).

$(-\infty, \infty)$ $(-\infty, 3]$ $(-\infty, 3)$ $(3, \infty)$

2. (*2 points*) Suppose $y = \dfrac{1}{x-3}$ is a solution to a differential equation. Is $(-\infty, 3) \cup (3, \infty)$ the interval of validity for the solution (or the domain of the solution)? If so, explain why. If not, provide a possible domain.

(There is another problem on the next page!)

3. (*5 points*) Consider the function $f = c_1 \cos(3t) + c_2 \sin(3t)$, where c_1 and c_2 are arbitrary constants. We are given that $f = c_1 \cos(3t) + c_2 \sin(3t)$ is a 2-parameter family of solutions to the differential equation $f'' + f = 0$. Find a solution to the IVP consisting of this differential equation and the following initial conditions:

$$f\left(\frac{\pi}{3}\right) = \sqrt{2}, \qquad f'\left(\frac{\pi}{3}\right) = \sqrt{3}.$$