UBC ID #: _____ NAME (print): _____

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THE UNIVERSITY OF BRITISH COLUMBIA

Irving K. Barber School
of Arts and Sciences
UBC Okanagan

Instructor: Rebecca Tyson Course: MATH 225
Date: Mar 22nd, 2017 Time: 11:30am Duration: 35 minutes.
This exam has 5 questions for a total of 20 points.

SPECIAL INSTRUCTIONS

- Show and explain all of your work unless the question directs otherwise. Simplify all answers.
- The use of a calculator is not permitted.
- Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, ask for extra paper.

This is a two-stage exam. You have 35 minutes to complete the exam individually, then you will hand in the tests and join your group to redo the test as a group in the remaining 35 minutes.

Question:	1	2	3	4	5	Total
Points:	3	2	6	6	3	20
Score:						

[3] 1. Find the general solution of $t^2z'' + tz' + 9z = 0$.

[2] 2. For which of the ODEs below could you use the method of undetermined coefficients (MoUC) to find a particular solution? In cases where MoUC applies, give the form of the particular solution.

(a) $4y'' + ty = 2cos(t)$,

(b) $y'' + 3y' - y = t\cos(2t)$

(c) $y'' - 2y' + y = \dfrac{e^t}{1+t^2}$

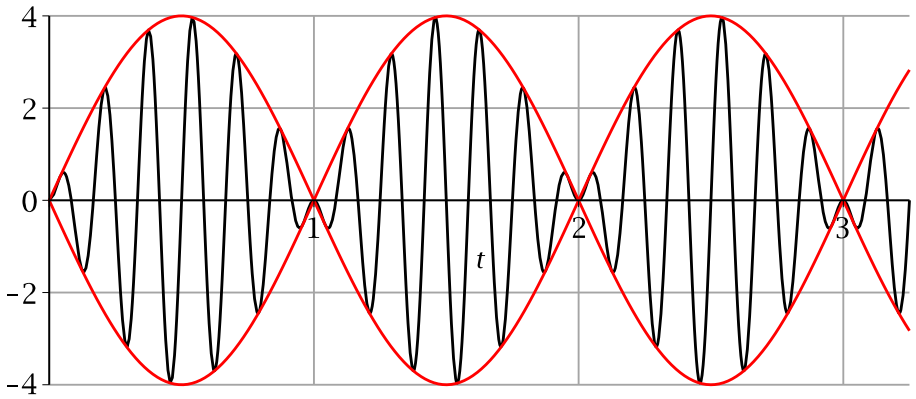
6 3. Consider the ODE $y'' - 2y' + y = e^t/t$. Given that two linearly independent solutions of the associated homogeneous ODE are $y_1(t) = e^t$ and $y_2(t) = te^t$, find a general solution of the ODE. Assume $t > 0$.

6 4. Consider the ODE $y'' - 4y' + 4y = 0$. The characteristic equation has a double root, $r = 2$, and so one solution of the ODE is $y_1(t) = e^{2t}$. Use reduction of order to derive a second linearly independent solution. Then write the general solution.

3 5. The solution behaviour of a particular mass-spring system is shown below. With reference to the figure, answer the following questions:

(a) What is the illustrated behaviour called (2 names)? What is it useful for?

(b) What ingredients are necessary to produce this behaviour? List all of them.



BONUS PROBLEM, 2pts Determine the mass-spring frequency (in the absence of forcing) and the forcing frequency for the mass-spring system in question 5.