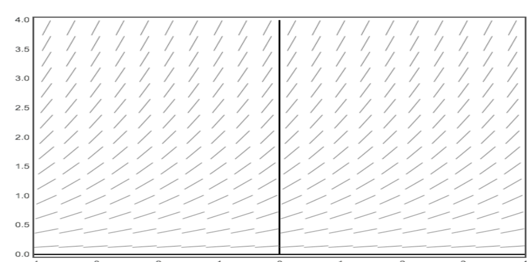
BC Calculus **Name_______________________________**
2020 Exam Practice
FR #6 (25 minutes: 15 points)

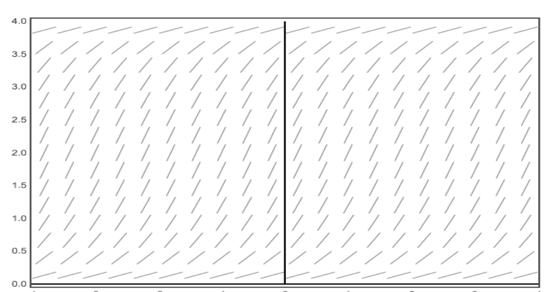
Set a timer for 25 minutes to complete this problem. You may use your notes, textbooks, or any materials I gave you throughout the year. You are not expected to use a calculator, but you may use one if you would like. You should show all your steps as if you did not have a calculator. I am guessing that the 25-minute problem will be worth 15 points and the 15-minute problem will be worth 10 points for a total of 25 points. The college board has said that the 25-minute problem will be worth 60% and the 15-minute problem will be worth 40%, so that is my best guess at how it may be broken down this year. Please show all appropriate mathematics: no bald answers!

Two scientists, Gill and Jeff, are studying the stinkbug population in the upstairs hallway. At the beginning of their study ($t = 0$) the stinkbug population is 1000. Both scientists decide to come up with differential equations that each believes will accurately model the population of stinkbugs. Gill decides on the model $\frac{dG}{dt} = \frac{1}{2}G$, with $G(0) = 1$, where t is measured in days and $G(t)$ is measured in thousands of stinkbugs. Jeff comes up with the alternate model $\frac{dJ}{dt} = \frac{1}{2}J(4 - J)$, with $J(0) = 1$, where t is measured in days and $J(t)$ is measured in thousands of stinkbugs.

a) Scientist Gill draws his slope field as shown below. Draw in the particular solution that passes through the point (0,1). [2 points]



b) Scientist Jeff draws his slope field as shown below. Draw in the particular solution that passes through the point (0,1). [2 points]



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c) Find the particular solution to Scientist Gill's differential equation $\frac{dG}{dt} = \frac{1}{2}G$ with the initial condition that $G(0) = 1$. [5 points]

d) Find the particular solution to Scientist Jeff's differential equation $\frac{dJ}{dt} = \frac{1}{2}J(4 - J)$ with the initial condition that $J(0) = 1$. (This solution will require the use of Partial Fractions decomposition.) [6 points]