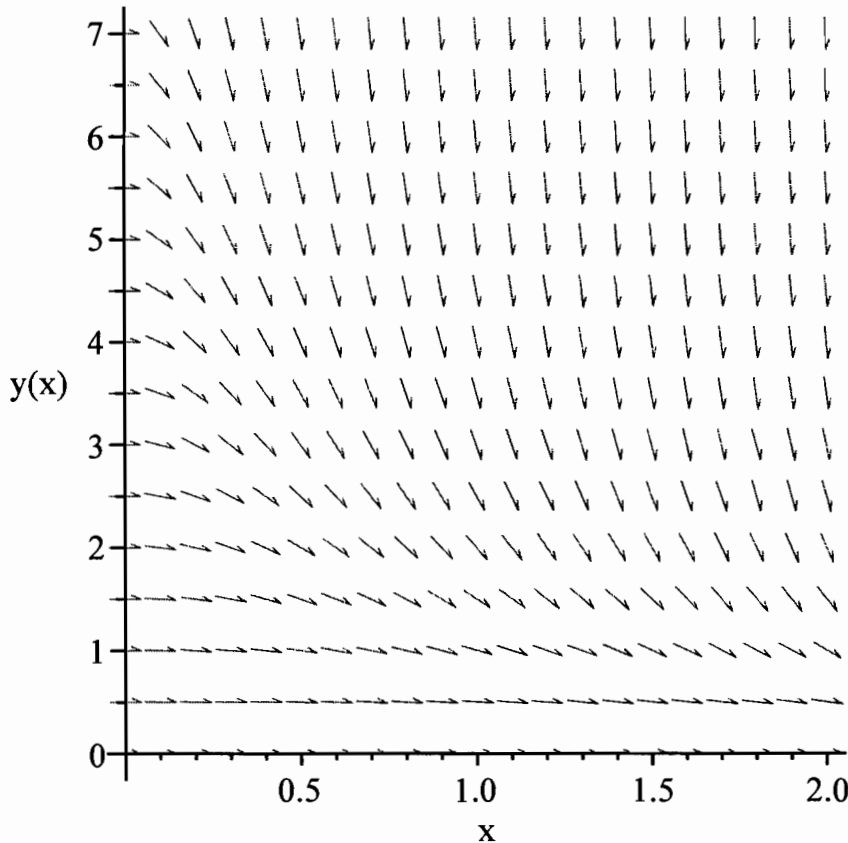


Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use arrows and equal signs when appropriate. Always simplify expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC): only for antiderivatives, finding a root, or checking.

1.  $y' = -x y^2, \quad y(1) = 3/2$



- a) On the figure mark the initial data point  $y(1) = 3/2$  with a circled bullet  $\odot$  and then draw in your graphical estimate of the solution curve through that point.
- b) Estimate  $y(0)$  from part a).
- c) Find the exact general solution by hand.
- d) Find the solution which satisfies the initial condition. [Your final answer should be  $y(x) = \dots$ ]
- e) Evaluate your solution at  $x = 0$  and compare to your estimate. Explain whether they seem consistent or not.
- f) Check that your general solution satisfies the DE.

2.  $T'(t) = -k(T(t) - 42)$  Newton's law DE for the dr bob experiment

- a) dr bob put a cup of boiling water (212 degrees) in his slightly out of temperature range fridge (42 degrees) with an erratically reading digital probe thermometer. After 1 hour he reads off 91 degrees. Use the linear solution technique by hand to solve the Newton's law model DE with the appropriate initial condition at  $t = 0$ , and find the value of  $k$  that the data determines.
- b) Evaluate your temperature function at 2 hours. dr bob found a reading of 68 degrees. Is the Newton's law model appropriate for dr bob's experiment? Explain.

### ▼ pledge

When you have completed the exam, please read and sign the dr bob integrity pledge and hand this test sheet in on top of your answer sheets as a cover page, with the first test page facing up:  
 "During this examination, all work has been my own. I give my word that I have not resorted to any ethically questionable means of improving my grade or anyone else's on this examination and that I have not discussed this exam with anyone other than my instructor, nor will I until after the exam period is terminated for all participants."

Signature: \_\_\_\_\_

Date: \_\_\_\_\_