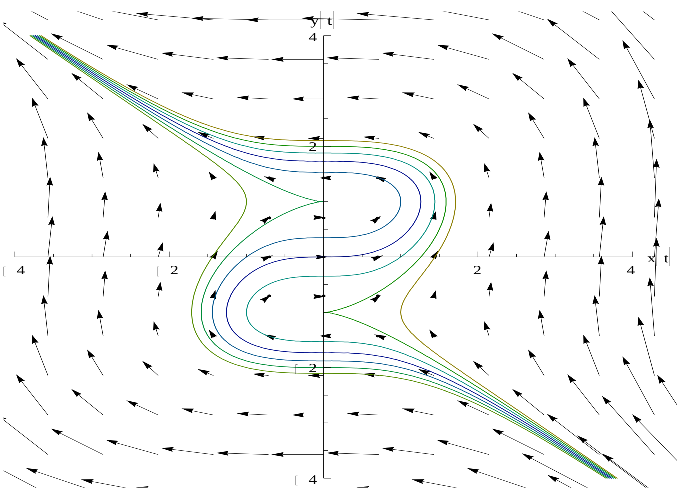
Exam is 1 hour 15 minutes.
Ok: handwritten notes, calculator (TI 83/84) **Not ok**: printouts, book, **TI 89,** laptop, tablet, cell phone or other handheld

Part I (30%, 10 min) ~ quizzes: fill in blank, short answer, T-F, matching. Emph: defs, thms & analysis using slope field.

There are 2 theorems which apply to first order ODE's. For a linear equation, as long as the coefficient functions are continuous, a solution always____________ and is _______________. In fact, the validity of solutions will extend until a discontinuity in the coefficient functions is reached. For instance, for $y'-3/(t^2-4)y=1/t^2;\quad y(1)=3$, the solution has _____________ as its interval of validity. For a nonlinear equation $y'=f(t,y)$, a solution always____________ and is _______________provided that f and the ____________ ____________ (2 words) of f are ______________ around the IV. A slightly weaker theorem holds if we have _____________ of f but not its ____________ ____________ (2 words). In that case, we get ____________ but not _______________. For the nonlinear equation $\dfrac{dy}{dx}=\dfrac{x^2}{1-y^2}$ a solution will always ____________ and is _______________ provided that __________. The interval of validity is much more complicated as it will



vary for each initial value. The slope field for the same equation is given to the left. For the IV (0,0), darken the solution on the graph. The approximate interval of validity for the solution is ___________. For the IV (0,2), darken its solution on the graph. The approximate interval of validity for its solution is ___________. We discuss the limiting behavior, assuming that the solutions follow the direction fo the arrows.

For any solution whose initial value is in Q1 and has y>1: It is repelled from $y=1$, y = −x. (circle one) and it is attracted to $y=1$, y = −x. (circle one). $\lim\limits_{x\to-\infty} y =$ ______________.

Part II (15%, 15 min) Linear first order IVP with nonconstant coefficients (explicit sol'n)

$$ty'+2y=t^2-t+1;\quad y(1)=1/2$$

Part III (15%, 15 min) Exact equation which requires an I.F, like p 134 #31. (1st verify exactness, implicit sol'n)

$$\frac{dy}{dx}=-\frac{3x^2y+y^2}{2x^3+3xy}$$

Part IV (10%, 10 min) Euler method for numerical solution: *h* = 0.5; *t* final is 4. Be sure to provide a screen shot for the "y=" window in "seq" mode as well a table showing the values of *t* and *y* for integer values of *t*.

$$y'=2+3t-y;\quad y(1)=-1$$

Part V (30%, 20 min) 3 1st order eqtns. Identify type, provide 1st few steps for sol'n, & check soln (will be given).
p. 133, problems 4, 30 and 32. See openlab "part V exam 1" for solutions.