

Name: (please print name as it appears in Canvas here →) _____.

MATH 334: SURPRISE ATTACK MISSION 4: APPLICATIONS AND VISUALIZATION [10PTS]

Write answers in white space provided and attach supporting work on pages which follow. Staple in upper left corner, work on one side of paper. Thanks!

Problem 1 Find the orthogonal trajectory of $\frac{dy}{dx} = \frac{y}{1+\sin x}$ which passes through $(0, -\sqrt{3})$. Write your answer with y as an explicit function of x .

Problem 2 Find the explicit solution of $\frac{dy}{dx} = \frac{y^2+xy+x^2}{x^2}$ via a $v = y/x$ substitution.

Problem 3 Find the integral curve of the vector field $\vec{F} = \langle x^2 - 3x + 2, y^2 + 4y + 4 \rangle$ through the point (x_o, y_o) . Write your answer with y as an explicit function of x .

Problem 4 Solve PP 48 (about Koolaid) from the Lecture Notes.

Problem 5 Let b be a positive constant. If a friction force of $F_f = -bv^4$ is applied to a mass m with initial position x_o and initial velocity v_o then find the velocity as a function of

(a.) time t ,

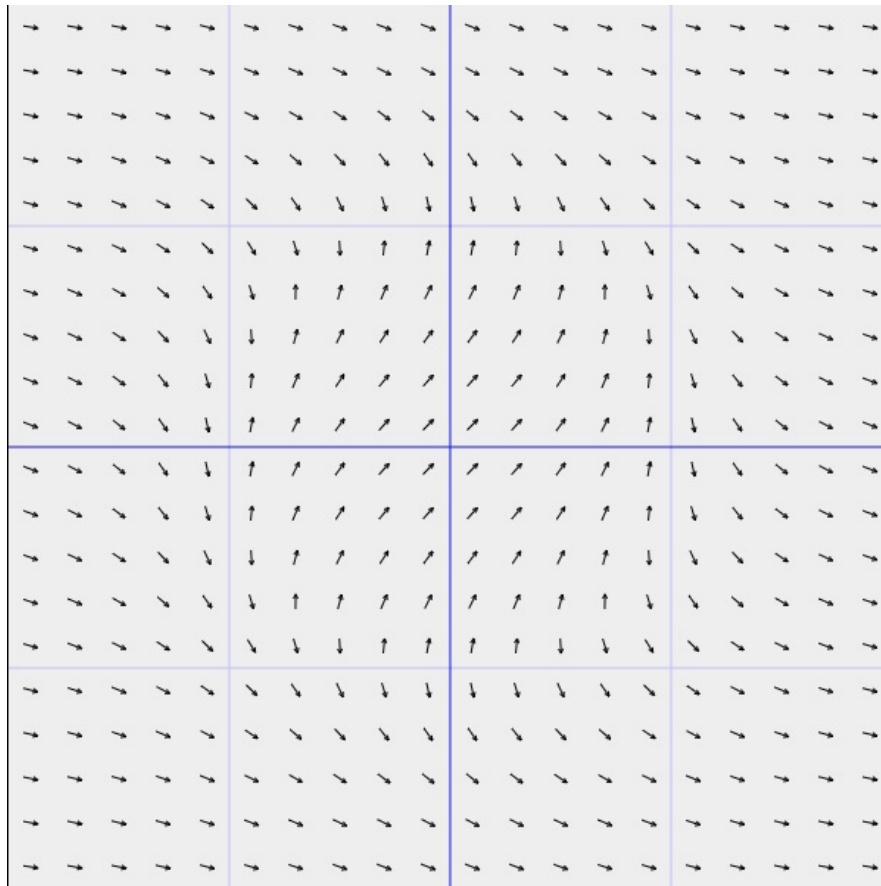
(b.) position x ,

Problem 6 Consider PP 72 on page 67 the Lecture Notes. Fill in the blanks below as appropriate with I, II, III or IV:

(A.) = _____. (B.) = _____. (C.) = _____. (D.) = _____.

Problem 7 A chain is coiled on the ground. One end is lifted with a constant force F . Find the velocity. Assume the chain uniform weight-density w per foot and use x for the length lifted in feet.

Problem 8 Plot solution curves for the direction field of $\frac{dy}{dx} = \frac{1}{1-x^2-y^2}$ given below and explain what is happening at the unit-circle for the solutions. Try it out in the pplane to check your hand-drawn answers here (maybe starting with a pencil lightly then tracing over with pen once you're sure would be wise here)



Remark: I used <https://aeb019.hosted.uark.edu/pplane.html> to generate the direction field above.