

MATH2403B _____
INSTRUCTOR: _____

3-30-2000

TEST 5

NAME: _____
STUDENT NO: _____Show all work.

1. For the scalar first order equation, $x'(t) = x(x - 1)(x - 2)(x^2 - 4)$, find all critical points and use a phase-portrait to determine their stability.

2. Determine the stability and the type of the critical point $(0,0)$ of each of the three systems. Match each with one of the three phase-portraits as shown in Fig. 1, Fig. 2 and Fig. 3

$$(a) \begin{aligned} x' &= x - 2y, & (b) \begin{aligned} x' &= -x + 5y, & (c) \begin{aligned} x' &= -3x + 2y, \\ y' &= x - y; & y' &= -x - 3y; & y' &= -2x + y. \end{aligned} \end{aligned}$$

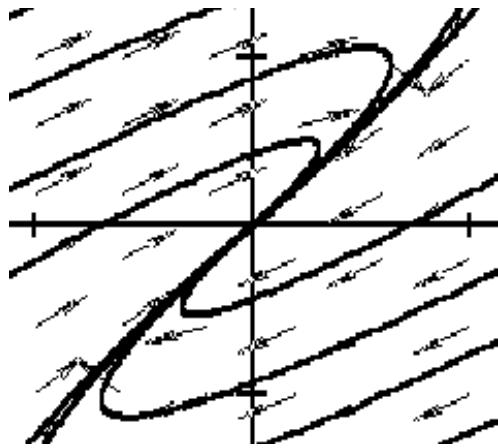


Fig. 1

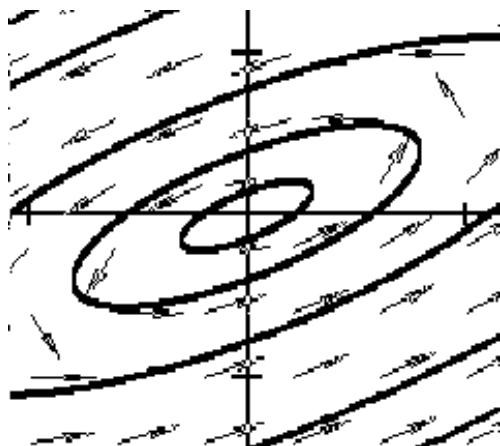


Fig. 2

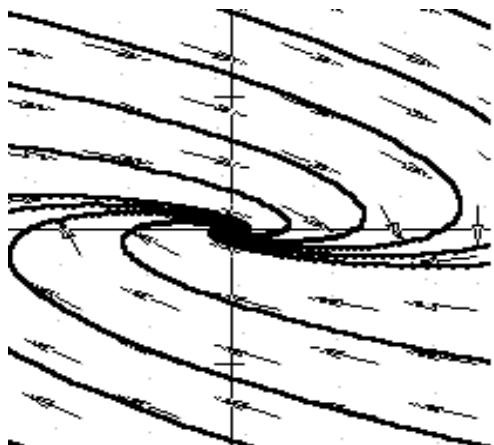


Fig. 3

3. Consider the system, $x' = -x + y^2$, $y' = x - 4$.

(A) Find all critical points.

(B) Compute the Jacobian matrix.

(C) Use the Jacobian matrix to determine the type and stability of each critical point.