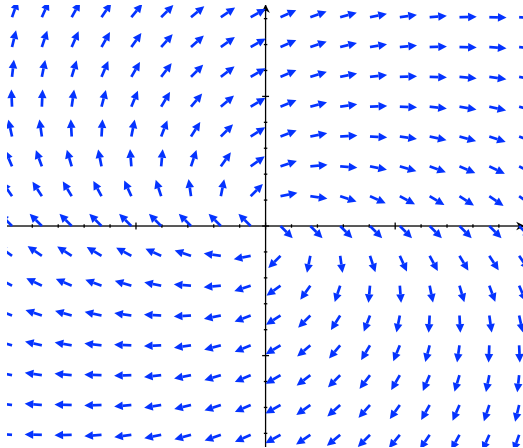Work quickly and carefully, following directions closely. Answer all questions completely.
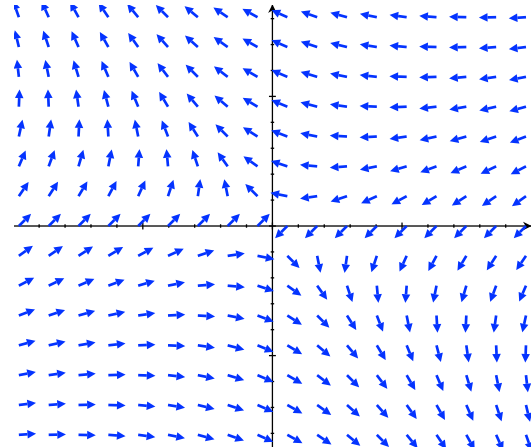
FOR ALL PROBLEMS: Define P, Q, R, and S to be the four digits in your given number.

$$P = \underline{\quad}, \qquad Q = \underline{\quad}, \qquad R = \underline{\quad}, \qquad S = \underline{\quad}.$$

§I. EQUILIBRIA. List the type of equilibrium and its stability. There are 4 graphs at 2 points each.

Type: [____]   Stable: [____]

Type: [____]   Stable: [____]

Type: [____]   Stable: [____]

Type: [____]   Stable: [____]

[____]

FOR ALL PROBLEMS: Define P, Q, R, and S to be the four digits in your given number.

$$P = \underline{\quad}, \qquad Q = \underline{\quad}, \qquad R = \underline{\quad}, \qquad S = \underline{\quad}.$$
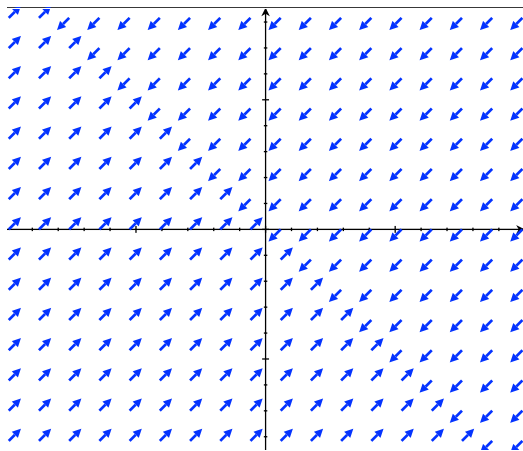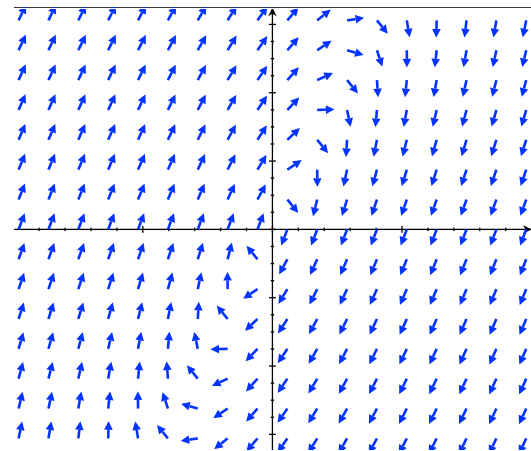
§II. PROBLEMS. *You must show your work to receive credit.* There are 2 problems at 10 points each.

1. Find a general solution to the differential equation $\frac{d}{dt}\vec{X} = \mathbf{A}\vec{X}$ with $\mathbf{A} = \begin{bmatrix} 2 & 3P \\ 0 & -1 \end{bmatrix}$ where P is your number.

2. Find a general solution to the differential equation $\frac{d}{dt}\vec{Y} = \mathbf{B}\vec{Y}$ with $\mathbf{B} = \begin{bmatrix} 1 & Q^2 \\ -1 & 1 \end{bmatrix}$ where Q is your number.

How can Thursday, the 13th, be more unlucky than Friday, the 13th?