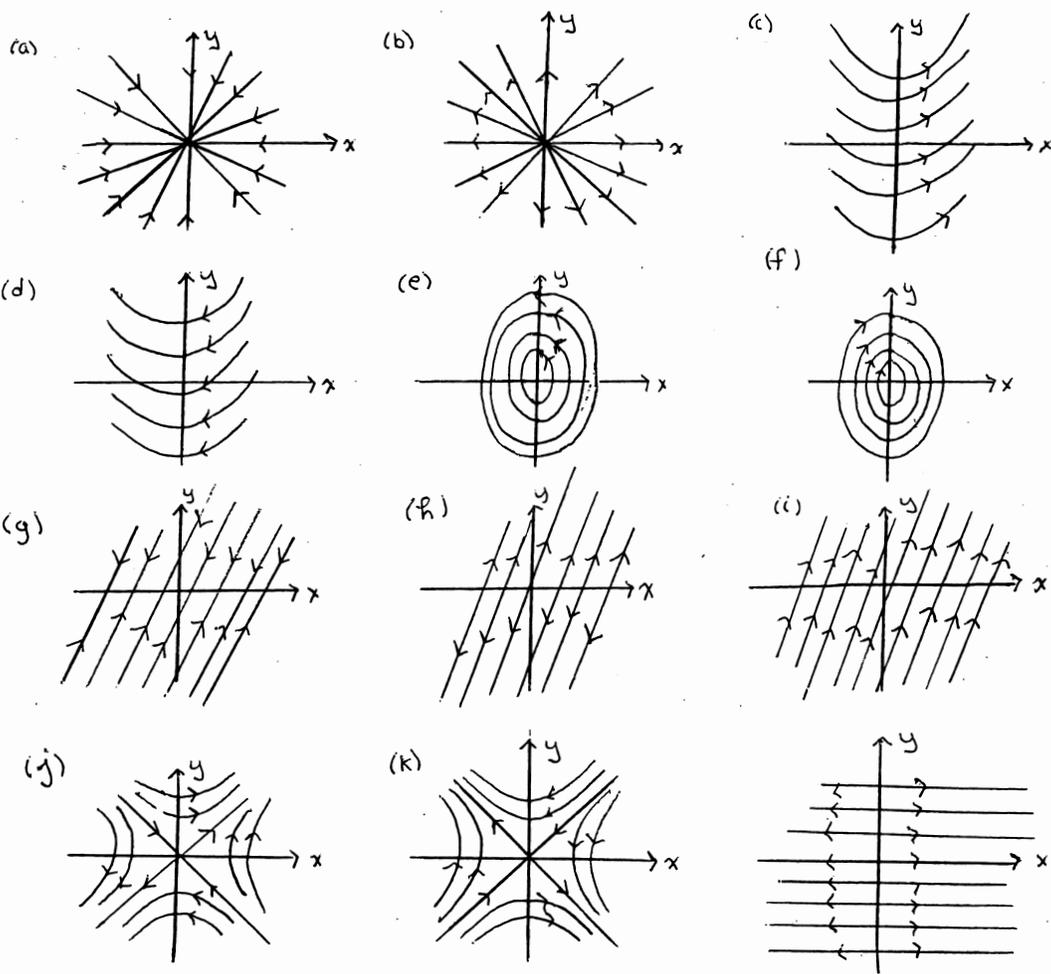


Systems of Differential Equations

The problems refer to these diagrams:



1. Find the diagram which matches the system.

(i) $\frac{dx}{dt} = y$ and $\frac{dy}{dt} = -2x$.

(ii) $\frac{dx}{dt} = y$ and $\frac{dy}{dt} = 3y$.

2. (i) Suppose that the system $\frac{dx}{dt} = f(x, y)$ and $\frac{dy}{dt} = g(x, y)$ has phase portrait (e). Sketch possible graphs of $x(t)$ and $y(t)$, assuming $x(0) = 0$ and $y(0) = 3$.



(ii) Do the same thing for (g).



3. Solve the system $\frac{dx}{dt} = y$ and $\frac{dy}{dt} = 3y$ with initial conditions $x(0) = 0$ and $y(0) = 3$.

4. Solve the system $\frac{dx}{dt} = y$ and $\frac{dy}{dt} = -2x$ with initial conditions $x(0) = 0$ and $y(0) = 3$.

5. Find a system of differential equations whose phase portrait looks like (1), the last diagram.