1. (3) Suppose the differential equation $x' = f(x)$ has the following phaseline:

What does the graph of $f$ look like?

2. (3) Draw the phase line for the differential equation

$$\frac{dx}{dt} = x^4 - x^3 - 6x^2.$$

Sketch a graph of the solutions of the differential equation which also satisfy the initial conditions: $x(0) = 1$, $x(0) = 3$, and $x(0) = -1$.

3. (4) Draw the bifurcation diagram for the one parameter differential equation:

$$\frac{dx}{dt} = x^2 + 3x + \alpha.$$