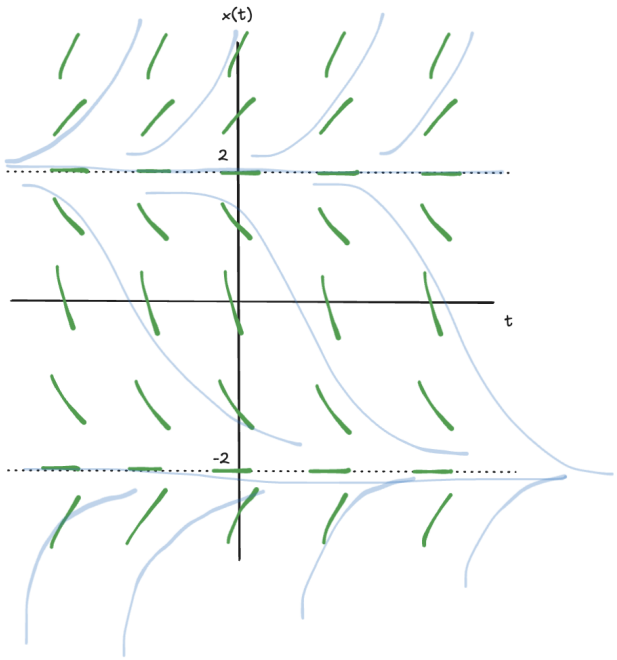
Problem 1: Interpret $x' = \sin x$ s flow on a line. The fixed points are $2k\pi$ for $k \in \mathbb{Z}$

Problem 2: $x' = 4x^2 - 16$

$x = 2$ is a unstable fixed point. $x = -2$ is a stable fixed point.

$$\begin{aligned}
\frac{dx}{dt} &= 4x^2 - 16 \\
\frac{dx}{4x^2 - 16} &= dt \\
\frac{1}{16}\left(\frac{dx}{x-2} - \frac{dx}{x+2}\right) &= dt \\
\frac{1}{16}(\ln|x-2| - \ln|x+2|) &= t + c \\
\ln\left|\frac{x-2}{x+2}\right| &= 16t + 16c \\
\left|\frac{x-2}{x+2}\right| &= e^{16t+16c} \\
\frac{x-2}{x+2} &= ke^{16t} \\
x - 2 &= Ce^{16t}(x+2) \\
x(1 - Ce^{16t}) &= 2Ce^{16t} + 2 \\
x &= \frac{2Ce^{16t} + 2}{1 - Ce^{16t}}
\end{aligned}$$



Problem 3: $x' = x - x^3$

$x = -1, 1$ are stable fixed points. $x = 0$ is an unstable fixed point.