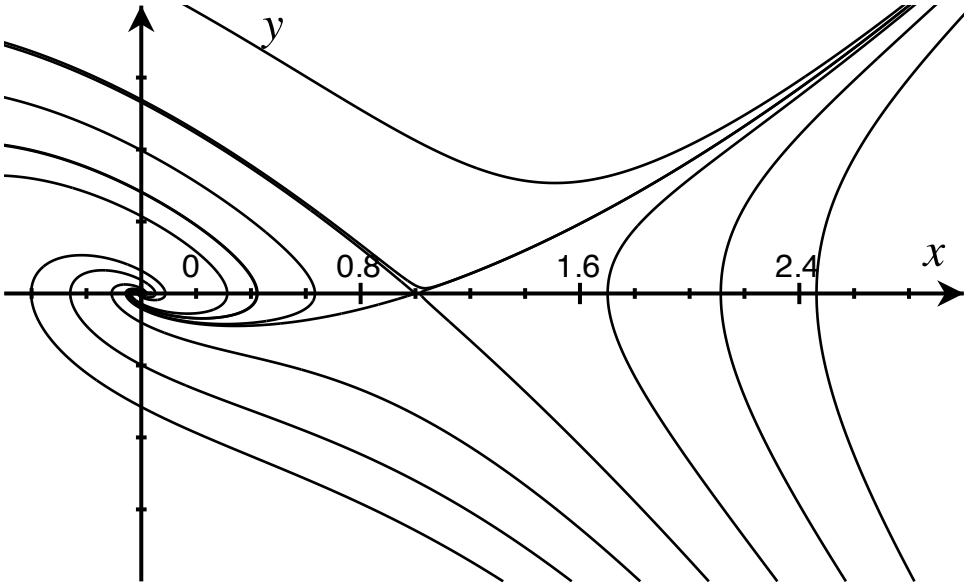
Fisher's Equation

In class we examined the traveling-wave solutions of *Fisher's equation*:

$$\frac{\partial N}{\partial t} = N(1-N) + \frac{\partial^2 N}{\partial x^2}$$

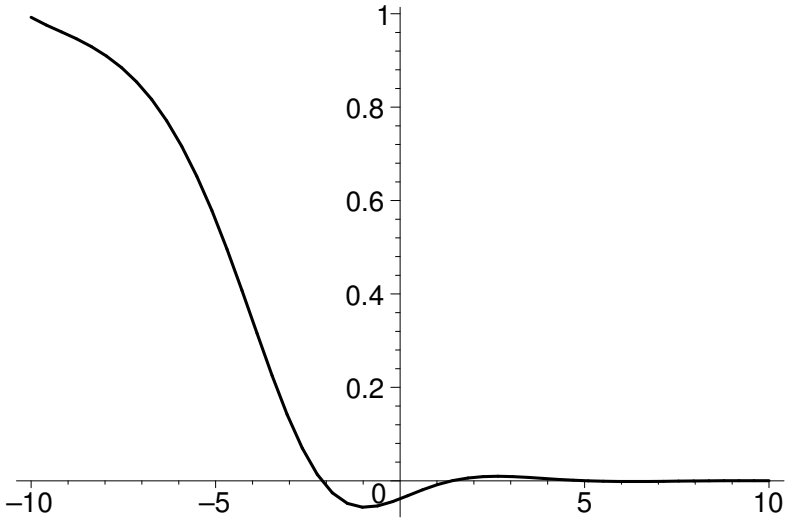
by letting $N(x,t) = u(x-ct)$.

Here is the phase plane for $c = 1$. Note that in this diagram, negative x corresponds to negative u, and hence disallowed solutions.



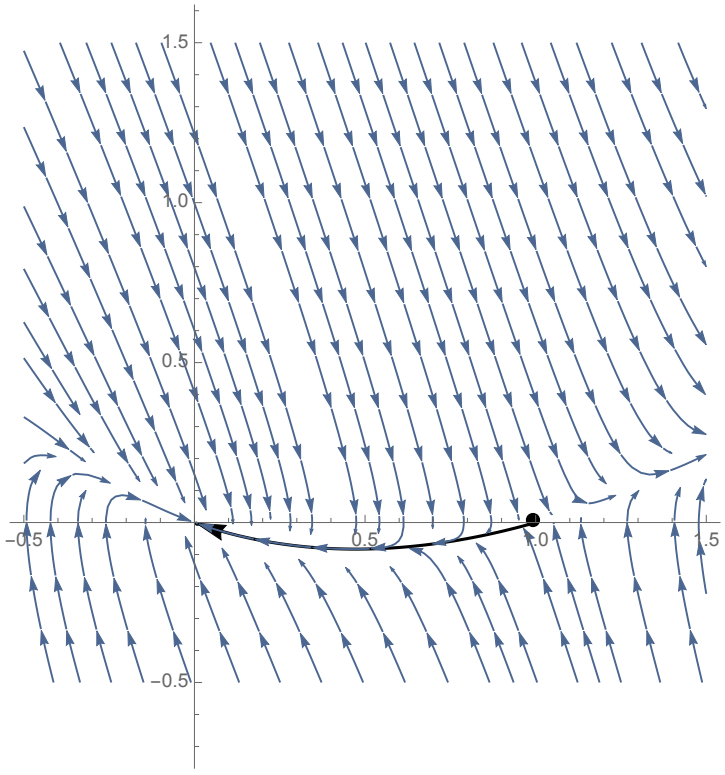
Phase plane for $c = 1$.

We also graph the traveling-wave solution corresponding to $c = 1$; note the negative values.

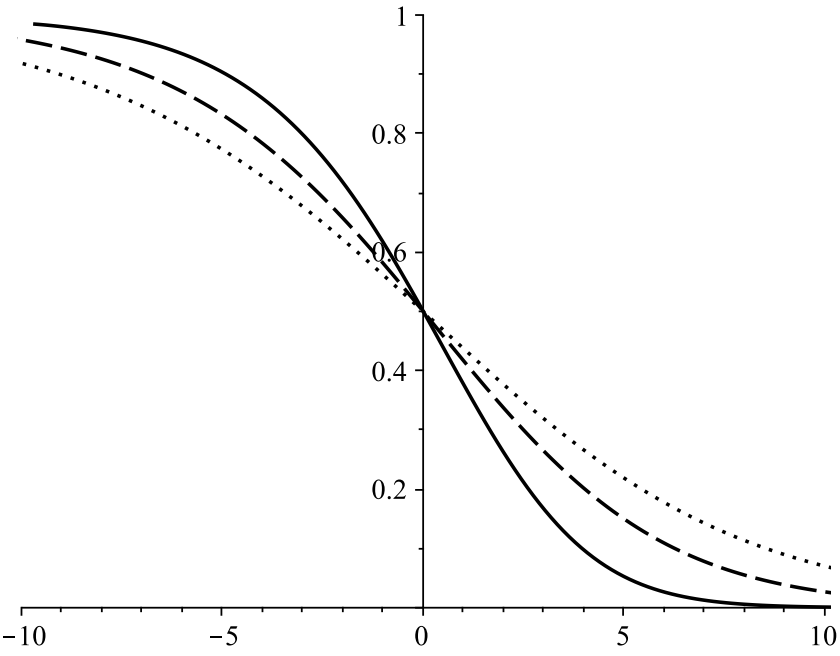


Traveling-wave solution for $c = 1$.

Here is the phase plane for $c = 3$. Note that in this diagram, the traveling-wave solution doesn't cross the y-axis. (Negative values of y are acceptable, since they correspond to negative u', which we know must occur.)



Phase plane for $c = 3$, along with the trajectory corresponding to the traveling-wave solution.



Traveling-wave solution for $c = 2$ (solid), $c = 3$ (dash), $c = 4$ (dot).

We graph the traveling-wave solutions for $c = 2$, 3, and 4 above. Note that as c decreases, the curve becomes steeper.