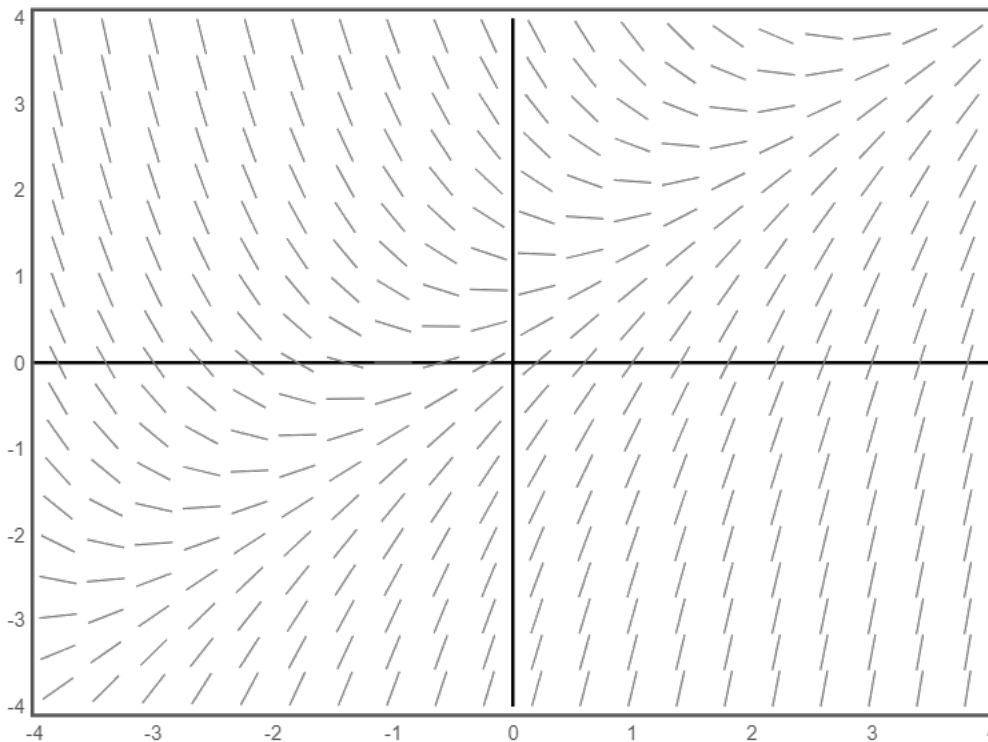


MATH 1B DISCUSSION WORKSHEET - 10/30/18

DIRECTION FIELDS AND EULER'S METHOD

1. WORKING WITH DIRECTION FIELDS



- (1) Sketch the solution on this graph corresponding to the initial value $y(1) = -3$.

- (2) Sketch the solution on this graph corresponding to the initial value $y(-1) = 2$. Use this solution to estimate $y(1)$.

- (3) Sketch the solution on this graph corresponding to the initial value $y(1) = 1$. What line is this?

2. EULER'S METHOD

- (1) Consider the IVP $y' = -xy^2$ with $y(1) = 1$.
- (a) Use Euler's Method to approximate $y(2)$ with step size 0.5.

 - (b) Use Euler's Method to approximate $y(2)$ with step size 0.25.

 - (c) Solutions to this differential equation are of the form $y = \frac{2}{C + x^2}$ for some constant C . Prove that these are in fact solutions to the differential equation.

 - (d) Find the value of C that satisfies this IVP.

 - (e) Plug in $x = 2$ to determine how close your approximations were to the actual value. Which approximation was better?
- (2) Consider the IVP $y' = -\frac{2xy}{1+x^2}$ with $y(0) = 1$.
- (a) If I wanted to estimate $y(1)$ in four steps, how big would each step be?

 - (b) Use Euler's Method to approximate $y(1)$ in four steps.

 - (c) Solutions to this differential equation are of the form $y = \frac{C}{1 + x^2}$ for some constant C . Prove that these are in fact solutions to the differential equation.

 - (d) Find the value of C that satisfies this IVP.

 - (e) Plug $x = 1$ into the solution to determine how close your approximation was to the actual value.