

These questions relate to lecture material and aim to highlight the most important concepts. We will cover questions similar to these for our final.

1. Draw the values for the vector field $f(x,y) = (y, -x)$ at the points $(0,0)$, $(1,1)$, $(1,0)$, $(0,1)$

2. Suppose we had particle p with initial position $(1, 0)$. Suppose the velocity of the particle is given by $f(x,y) = (y, -x)$. If our timestep is 1, where is the particle after 2 steps using euler's method?

3. Suppose we have the same particle p as in question (2), where is the particle after 2 steps using the midpoint method?

4. Suppose we are simulating a particle p with velocity field $f(x,y) = (-kx, -ky)$. Suppose $k = 25$ and the particle's initial position is $(5,5)$. What does the trajectory of the particle look like if we simulate the particle using Euler's Method with a time step of 0.1?