

Name: _____

Mark: _____ / 16

Mini-math Div 3/4: Wednesday, October 18, 2023 (7.1-7.5) - 18 minutes

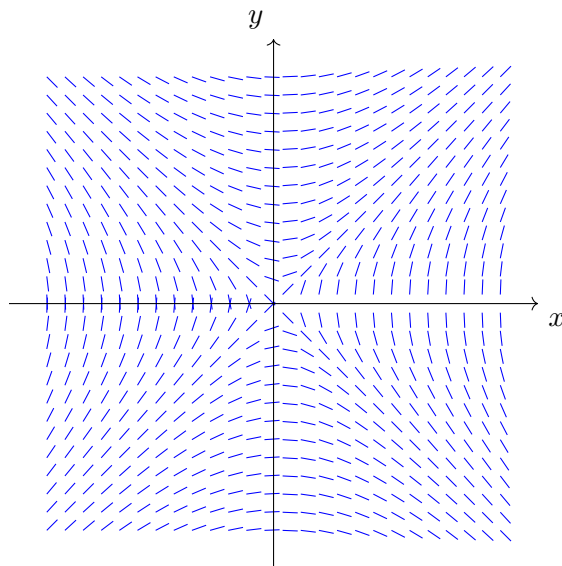
1. Write a differential equation that describes the following relationships. If necessary, use k as the constant of proportionality.
 - (a) (2 points) The rate of change of population, P , with respect to time, t , is inversely proportional to the square root of time and directly proportional to the area, A , that the population covers.

 - (b) (2 points) The position of a particle is given by $s(t)$, where t is measured in seconds. Its acceleration is directly proportional to its position. When the particle is at position 4 units, its acceleration is 2 units/ s^2 .

2. (4 points) Determine the value of k , if any, for which $y = \sin(2x) - k \sin(4x)$ would be a solution to the differential equation $y'' + 4y = 3 \sin(4x)$.

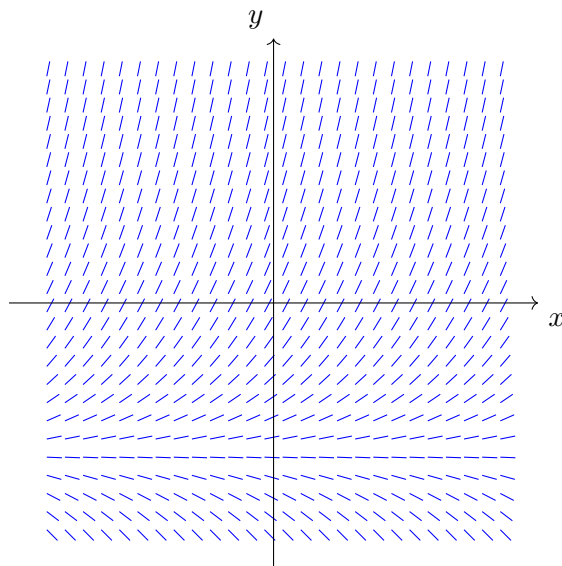
3. (2 points) What differential equation can the slope field to the right represent?

- A. $\frac{dy}{dx} = -x/y$
- B. $\frac{dy}{dx} = -y/x$
- C. $\frac{dy}{dx} = y^2$
- D. $\frac{dy}{dx} = x/y$
- E. $\frac{dy}{dx} = y/x$



4. (2 points) The slope field for a certain differential equation is shown to the right. Which of the following could be a particular solution to the differential equation?

- A. $y = x^3$
- B. $y = \frac{1}{x+2}$
- C. $y = -2^x - 2$
- D. $y = e^{-x} - 2$
- E. $y = e^x + 2$



5. Consider the initial value problem $\frac{dy}{dx} = 2x + y$ and $y(1) = 2$.

(a) (2 points) Find an approximation of $y(1.2)$ using Euler's Method with two equal steps.

(b) (2 points) Is your estimate in part (a) an overestimate or an underestimate?