

Exam 1
Chapter 1

Name: _____

Do not write your name on any other page. Answer the following questions. *Answers without proper evidence of knowledge will not be given credit.* Make sure to make reasonable simplifications.

Show your work!

1. (7 points) Verify that $y(x) = Ce^{-x} + x - 1$ is a solution to the differential equation

$$y' = x - y, \quad y(0) = 10,$$

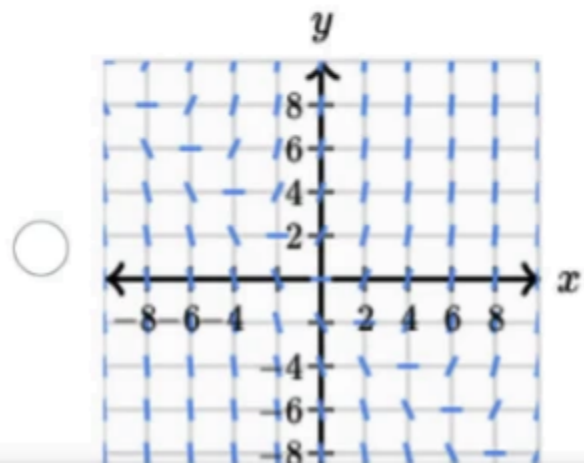
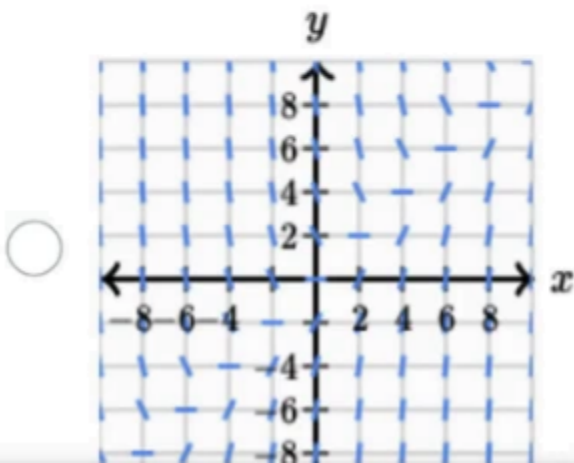
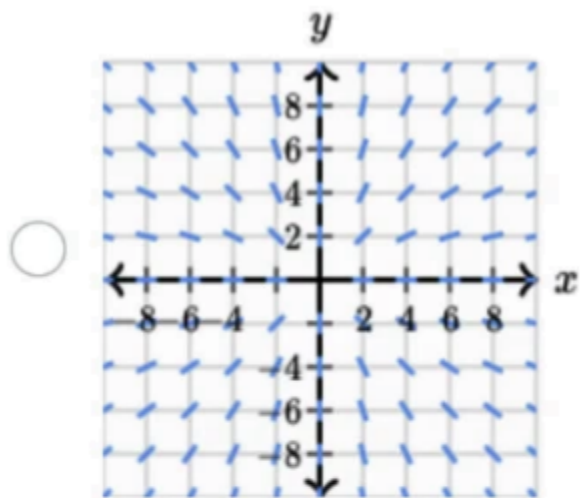
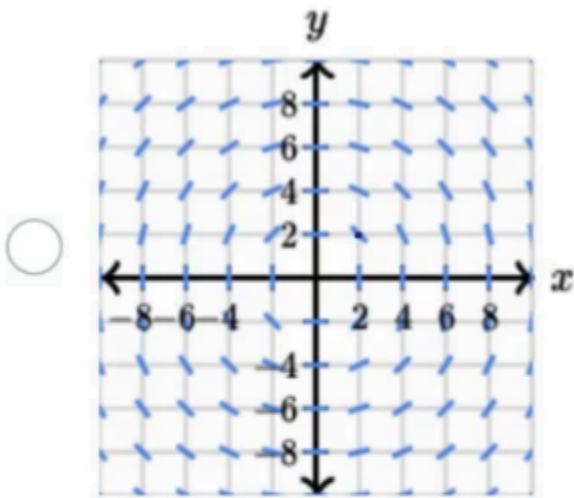
and find a value of C such that $y(x)$ satisfies the given initial condition.

2. (7 points) A diesel car gradually speeds up so that for the first 10s its acceleration is given by

$$\frac{dv}{dt} = (0.12)t^2 + (0.6)t \quad (\text{ft/s}^2).$$

If the car starts from rest ($x_0 = 0$, $v_0 = 0$), find the distance it has traveled at the end of the first 10 seconds and its velocity at that time.

3. (6 points) Which slope field is generated by the differential equation $\frac{dy}{dx} = -\frac{x}{y}$?



4. (10 points) Find the general solution to the differential equation

$$\frac{dy}{dx} + y^2 \sin x = 0.$$

5. (10 points) Find the particular solution to the differential equation on the given domain

$$y' + \frac{2}{t}y = \frac{\cos t}{t^2}, \quad y(\pi) = 0, \quad t > 0.$$

6. (10 points) Use the method of exact equations to solve the differential equation

$$(e^x \sin y + \tan y)dx + (e^x \cos y + x \sec^2 y)dy = 0.$$