

Name: _____

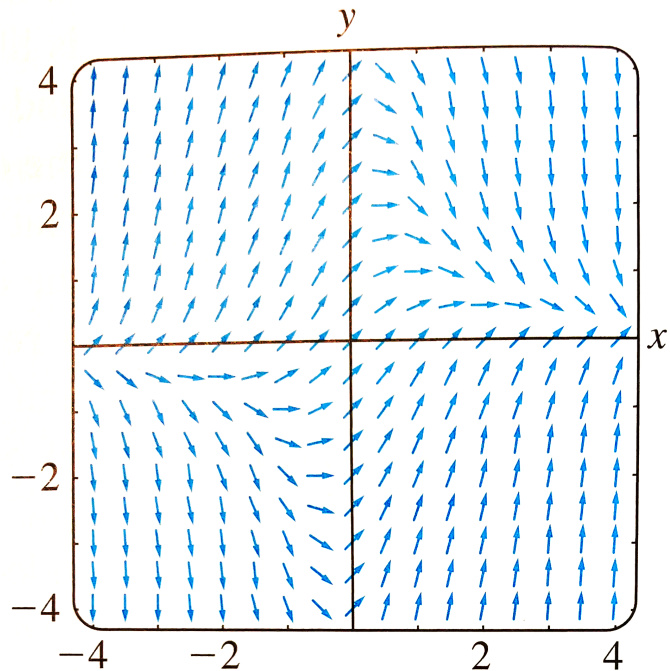
/ 25

25 minutes maximum. No aids (book, calculator, etc.) are permitted. Show all work and use proper notation for full credit. Answers should be in reasonably-simplified form. 25 points possible.

1. [4 points] The direction field of the following differential equation is shown: $\frac{dy}{dx} = 1 - xy$.

For each of the following points,
sketch an approximate solution curve.

- a) $y(0) = 0$
- b) $y(2) = 2$



2. [4 points] The same differential equation as in the previous question is **linear**: $\frac{dy}{dx} = 1 - xy$.

Find the general solution. You may write the solution in integral form if you do not know how to do an integral.

3. [4 points] Find the general solution by separation of variables:

$$\frac{dy}{dx} = e^{3x+2y}$$

4. [5 points] Determine whether this differential equation is exact. If it is exact, solve it:

$$x \frac{dy}{dx} = 2xe^x - y + 6x^2$$

Math 302 Differential Equations: Quiz 2

27 September, 2023

5. [8 points] For each of the following initial value problems, determine if the differential equation is separable, linear, or exact. Then find the solution.

a) $x \frac{dy}{dx} + y = 4x + 1, \quad y(1) = 8$

b) $\frac{dP}{dt} = -P^2, \quad P(0) = 3$

Math 302 Differential Equations: Quiz 2

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Extra Credit. [1 point] The following differential equation (DE) is separable: $\frac{dy}{dx} = y^2 - 4$.

Suppose that we want to solve the initial value problem for this DE with $y(3) = 2$. Explain very briefly why the separable (separation of variables) technique breaks down immediately. Then write down the solution anyway, without any calculation.

EXTRA SPACE