

Name

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Section

Key

$$\frac{dy}{dt} = y^2(1 - y^2)$$

1. (2 pts) What order is the differential equation above? Is it linear or nonlinear?

First Order Nonlinear

2. (3 pts) In the y - t plane below, sketch the slope field and several solutions to the differential equation. Be sure to include any constant solutions to the diffeq. In the y' - y plane below, sketch the derivative y' as a function of y .
3. (3 pts) What are the equilibrium points? Classify them according to their stability.

$y=0$ is semistable

$y=1$ is stable

$y=-1$ is unstable

3. (3 pts) Determine the asymptotic behavior of solutions for any initial condition

$$\lim_{t \rightarrow \infty} y(t) = \begin{cases} 1 & \text{if } y(0) \in (0, \infty) \\ 0 & \text{if } y(0) \in (-1, 0] \\ -1 & \text{if } y(0) = -1 \\ -\infty & \text{if } y(0) < -1 \end{cases}$$

