

HW 8 Due : Friday, Oct. 18

(1) (8.1 Problem 30) Solve the differential equation $\frac{dy}{dx} = \frac{1}{2}y^2 - 2y$ with $y(0) = -3$. Note that $\frac{1}{2}y^2 - 2y = \frac{1}{2}y(y - 4)$.

(2) (8.1 Problem 48) Solve the differential equation $\frac{dy}{dx} = x^2y^2$ with $y(1) = 1$

(3) (Part of 8.1 Problem 40) Suppose that the size of a population, denoted by $N(t)$, satisfies

$$(0.0.1) \quad \frac{dN}{dt} = 0.7N\left(1 - \frac{N}{35}\right).$$

(a) Determine all equilibria by solving $\frac{dN}{dt} = 0$.

(b) Solve the differential equation (0.0.1) with $N(0) = 10$ and find $\lim_{t \rightarrow \infty} N(t)$.

(c) Solve the differential equation (0.0.1) with $N(0) = 50$ and find $\lim_{t \rightarrow \infty} N(t)$.

(4) (Part of 8.2 Problem 4) Suppose that $\frac{dy}{dx} = y(2 - y)(y - 3)$

(a) Determine the equilibria of this differential equation.

(b) Graph $\frac{dy}{dx}$ as a function of y , and use your graph to discuss the stability of the equilibria.

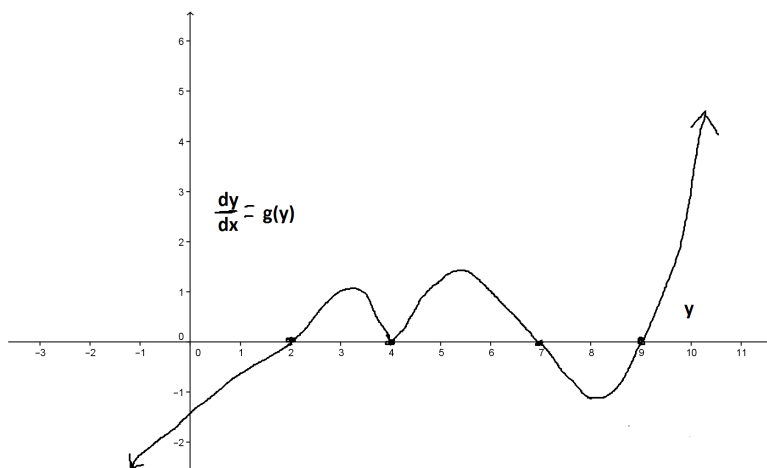


FIGURE 1. graph for Problem 5

(5) (sec 8.2) Suppose that $\frac{dy}{dx} = g(y)$ and the graph of $\frac{dy}{dx}$ as a function of y is given by the figure above

- (a) Determine the equilibria of this differential equation.
- (b) Use the graph to discuss the stability of the equilibria.

(6) Extra Practice Problems (These are extra problems for you to practice and you can check the answers at the back of the book)

Sec 8.1 Problem 29, 47, 39

Sec 8.2 Problem 3