

Quiz 1 September 2, 2005 (SOLUTIONS)

Problem 1. Consider the initial value problem

$$y' = \sin(x^2 + y^2), \quad y(1) = 0.$$

Mark each of the following statements as (T) “True” or (F) “False”. **You do not need to explain your answers.**

- (1) Theorem 1 in Ch 1.3 implies that the system has a unique solution on the interval $(-\infty, \infty)$.

Answer: FALSE

- (2) For some $\epsilon > 0$ the system has a solution on the interval $(1 - \epsilon, 1 + \epsilon)$.

Answer: TRUE

- (3) Theorem 1 in Ch. 1.3 implies that the system has no solutions on the interval $(-\infty, \infty)$.

Answer: FALSE

- (4) Theorem 1 in Ch 1.3 implies that for some $\epsilon > 0$ the system has at most one solution on the interval $(1 - \epsilon, 1 + \epsilon)$.

Answer: TRUE

- (5) Theorem 1 in Ch 1.3 implies that the system has infinitely many solutions on $(-\infty, \infty)$.

Answer: FALSE

Problem 2.

For the equation

$$\frac{dy}{dx} = (e^{x^7 \sin x} + x^2 + 1)(y^2 - 5y)$$

on the interval $(-\infty, \infty)$ find all the singular solutions (if there are any).

Answer: The singular solutions are $y = 0$ and $y = 5$.