Math 3321 − Spring 2024   Name:

Homework #2

You must justify all steps to get credit for your work

Please submit the HW via CASA or email your completed assignment <u>as a single PDF file</u> to `jshi24@CougarNet.UH.EDU`.

(1)[4Pts] Find the general solution and the solve the following IVP

$$6y' - 2y = xy^4, \quad y(0) = -2$$

(2)[4Pts] Find the general solution and the solve the following IVP

$$y' + \frac{1}{x}y - \sqrt{y} = 0, \quad y(1) = 0$$

(3)[4Pts] Find the general solution of the following problem

$$xyy' + 4x^2 + y^2 = 0$$

(4)[4Pts] Newton's law of cooling states that the temperature of an object changes at a rate proportional to the difference between its temperature and that of its surroundings. Suppose that the temperature of a cup of tea obeys Newton's law of cooling. If the tea has a temperature of 200F when freshly poured, and 1 min later has cooled to 190F in a room at 70F. Determine when the tea reaches a temperature of 150F.

(5)[4Pts] The size of a certain bacterial colony increases at a rate proportional to the size of the colony. Suppose the colony occupied an area of 0.25 square centimeters initially, and after 8 hours it occupied an area of 0.35 square centimeters.
(a) Estimate the size of the colony t hours after the initial measurement.
(b) What is the expected size of the colony after 12 hours?
(c) Find the doubling time of the colony