Math Biology 2024 Graded homework assignment # 1 max 20 pts

Academic Integrity Pledge:

I have neither given nor received any unauthorized help on this assignment:

Name: _____

Signature:_____

Directions:

- You must download this assignment from iCollege, complete all your work, and then upload it back to iCollege as your submission for this assignment.
- Your submission must consist of the completely filled out front page and your solutions
- Your submission must be a single pdf file. Picture files, such as jpeg or png, will not be accepted. Multiple files with all pages scanned separately will not be accepted.
- The assignment is due by **11:30 pm (Tuesday, September 10th).** Late submissions will not be accepted for any reason whatsoever.

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Problem 1 (5 pts)

(a) Use the linearization test to determine if the following steady state of the logistic equation is stable:

$$x_{n+1} = 3x_n(1-x_n), \quad x^* = 0.$$

(b) Use the linearization test to determine if the following steady state is stable:

$$x_{n+1} = -x_n^2(1-x_n), \quad x^* = (1+\sqrt{5})/2$$

Problem 2 (5 pts)

Find steady states and determine their stability. Try the linearization test first. If it fails, use the cobwebbing method to determine the stability and sketch the approximate behavior of solutions to the equations from some initial starting value of x_0.

$$x_{n+1} = \frac{x_n}{1+x_n}$$

Problem 3 (10 pts)

Consider the map : $x_{n+1} = 3x_n - x_n^3$

a) Find all the fixed points and determine their stability by the linearization test

b) Draw a cobweb starting at $x_0 = 1.9$. Mark at least three iterates x_1, x_2, x_3.

c) Draw a cobweb starting at $x_0 = 2.1$. Mark at least three iterates x_1, x_2, x_3.

d) Try to explain the dramatic difference between the orbits found in parts (b) and (c) after the three (or more) iterates.