Assignment 2

The due date for submitting this assignment has passed. Due on 2018-02-21, 23:59 IST.
As per our records you have not submitted this assignment.

1) Calculate the steady state of the following system of ODEs.

\[
\frac{d[X]}{dt} = \frac{1}{1 + [Y]} - [X] \quad ; \quad \frac{d[Y]}{dt} = 3 - [Y]
\]

- (x = 0.5, y = 1) and (x = 3, y = 3)
- (x = 0.25, y = 3)
- (x = 1, y = 1)
- (x = 0, y = 0)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(x = 0.25, y = 3)

2) Calculate the steady state of the following system of ODEs.

\[
\frac{dx}{dt} = 1 - x \quad ; \quad \frac{dy}{dt} = 2x - y
\]

- (x = 0, y = 0) and (x = 2, y = 3)
- (x = 2, y = 1)
- (x = 1, y = 2)
- (x = 2, y = 3)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(x = 1, y = 2)

3) The phase portrait of a system of ODEs involving two dependent variables, x and y is shown below. The system has a
A steady state at (0,0). Which of the following statements is correct?

- This steady state is a saddle point.
- This steady state is a source node.
- This steady state is stable node.
- This steady state is of center type.

No, the answer is incorrect.

Score: 0

Accepted Answers:
This steady state is a source node.

4) The direction field for an ODE with dependent variable \( x \) and independent variable \( t \) is shown. Identify the number of stable steady states in this system.

- 0
- 2
- 3
- 1

No, the answer is incorrect.

Score: 0

Accepted Answers:
1

5) Which of the following ODEs is represented by the direction field plot shown below?

- 2 points
No, the answer is incorrect.
Score: 0
Accepted Answers:

\[
\frac{dx}{dt} = t
\]

6) A Jsim code for modeling growth of fish in a tank is given below. Identify the mistake in the code.
The total duration of simulation is not defined.
Initial values are not declared correctly.
One parameter value is missing.
The derivative of the dependent variable is not represented correctly.

No, the answer is incorrect.
Score: 0

Accepted Answers:
The derivative of the dependent variable is not represented correctly.

7) The following system of ODE represents the dynamics of a transcriptional circuit involving two molecules, x and y.

\[
\frac{dx}{dt} = \frac{1}{1 + y^2} - x, \quad \frac{dy}{dt} = \frac{1}{1 + x^2} - y
\]

Simulate this system using JSim. Consider the following for the simulation:
Maximum time for simulation, tmax = 10; time intervals for simulation or time-step tdelta = 0.1; Initial values of
x and y are 1 and 20 respectively.

Which of the following figures represent the x vs y plot for this system? You may use also use any simulation tool other than JSim to answer this question.
8) Which of the following statements is correct for the following ODE? 2 points

\[
\frac{dx}{dt} = \frac{x}{1 + x}
\]

- It has only two steady states and one of that is stable.
- It has only one steady state and that is stable.
- It has only one steady state and that is unstable.
- It has only one two steady state and both are unstable.

No, the answer is incorrect.
Score: 0
Accepted Answers:
- It has only one steady state and that is unstable.

9) Calculate the x-nullclines for the following system of ODEs. 2 points

\[
\frac{dx}{dt} = x(2 - x - y) \quad \frac{dy}{dt} = y(-1 + x)
\]

- x = 0 and x = 1
- y = 0 and x = 0
10. Calculate the number of steady states for the following system of ODEs. \( 2 \text{ points} \)

\[
\frac{dx}{dt} = x(2 - x - y) \quad \frac{dy}{dt} = y(-1 + x)
\]

- y = (2-x) and \( x = 0 \)
- \( x = 0, x = (2-y) \) and \( x = 1 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
- \( y = (2-x) \text{ and } x = 0 \)