

Math 2326, Test I

Name _____

For problems 1-2 find the solution with given initial condition.

1. $\frac{dy}{dt} = \frac{t^2}{y+t^3y}$, with $y(0) = -2$

answer: $y = -\sqrt{4 + \frac{2}{3}\ln(1+t^3)}$

2. $\frac{dy}{dt} = -5y + 3e^{-5t}$ with $y(0) = -2$

answer: $y = -2e^{-5t} + 3te^{-5t}$

For problem 3 find the general solution.

3. $\frac{dP}{dt} + 5P = \sin(t)$

answer: $P = Ce^{-5t} + (5\sin(t) - \cos(t))/26$

4. For the differential equation $y' = 3xy$, $y(1) = 2$, take one step using Euler's method with $h = 0.001$, to approximate $y(1.001)$.

answer: $y(1.001) \approx 2.006$

5. The solution of $y' = y^2(y - 2)$, $y(0) = 1.9$ converges to what, as $t \rightarrow \infty$?

answer: $y \rightarrow 0$

6. Refer to the direction field plot on the last page to answer the following questions:

- a. (Multiple choice) The differential equation whose field is plotted could be:

1. $X' = X(X - 2)$
2. $X' = X(X + 2)$
3. $X' = X(X + 2)^2$
4. $X' = X^2(X + 2)$
5. $X' = X^2(X + 2)^2$

answer: (3)

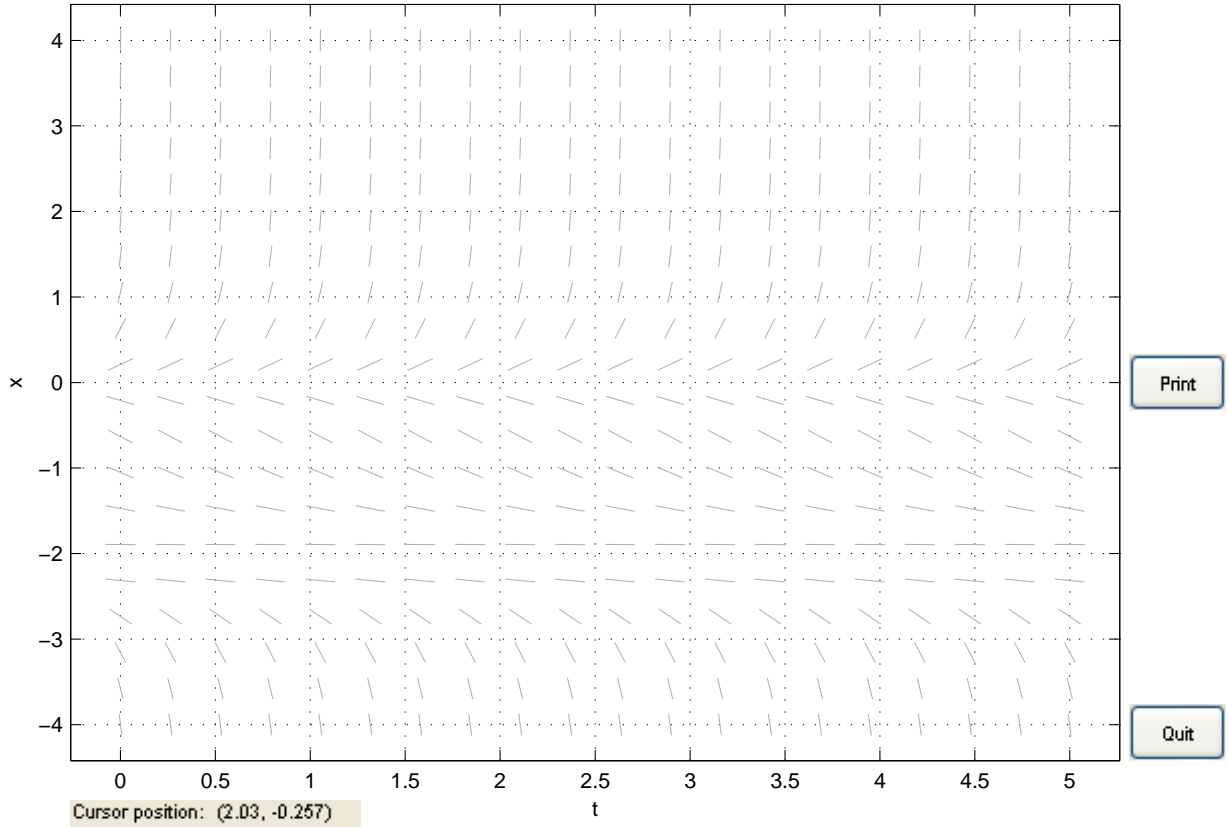
- b. Classify each equilibrium point as a sink, source or node.

answer: $x = 0$ is source, $x = -2$ is node.

7. The quantity $I(t)$ of iodine isotope I-131 present satisfies the differential equation $I'(t) = -0.08664I$, where t is in days. What is the half-life of I-131?

answer: 8 days

$$x' = x(2+x)^2$$



Ready.

Computing the field elements.

Ready.

Computing the field elements.

Ready.