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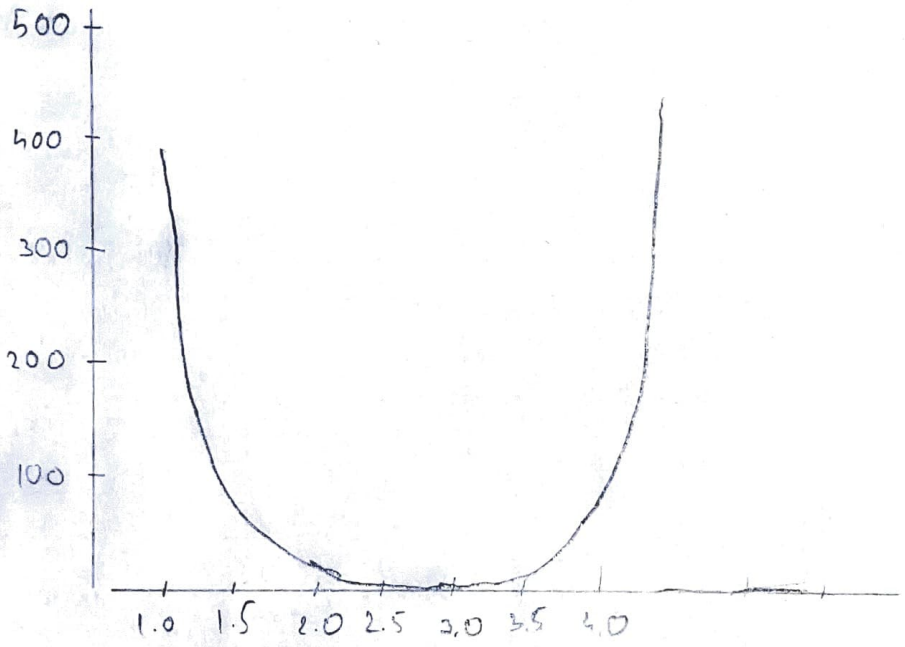
Dynamical Systems
Lab Test

1. The solution of the ivp is:

$$\frac{5}{8} \cdot e^{4t-4} + \frac{3}{8} e^{-4t+4}$$

The graph on the interval $[1, 4.4]$ is:



The approximate value in 0 is 19777.45749.

3. We have the matrix $A = \begin{bmatrix} -7 & 0 \\ 1 & 7 \end{bmatrix}$, whose eigenvalues are $\lambda_1 = -7$ and $\lambda_2 = 7$

The determinant is -49.

$$e^{tA} = \begin{bmatrix} e^{-7t} & 0 \\ \frac{e^{7t}}{14} - \frac{e^{-7t}}{14} & e^{7t} \end{bmatrix}$$

$-7 < 0 < 7 \Rightarrow$ SADDLE

As it is a SADDLE, the system is unstable.

4. The equilibrium points are:

$(0,0)$, $(0, \frac{17}{3})$, $(-34, -17)$

$\Rightarrow (0,0)$ is not the unique eq. point, but it is a hyperbolic eq. point.

5. Fixed points for $f: \mathbb{R} \to \mathbb{R}$, $f(x) = 0.002x(100-x)$ are: $x = 0$

$x = 50$