<u>Computational Physics</u>
<u>I semester – 2020-21</u>
<u>Lab Test-2 Answer sheet</u>

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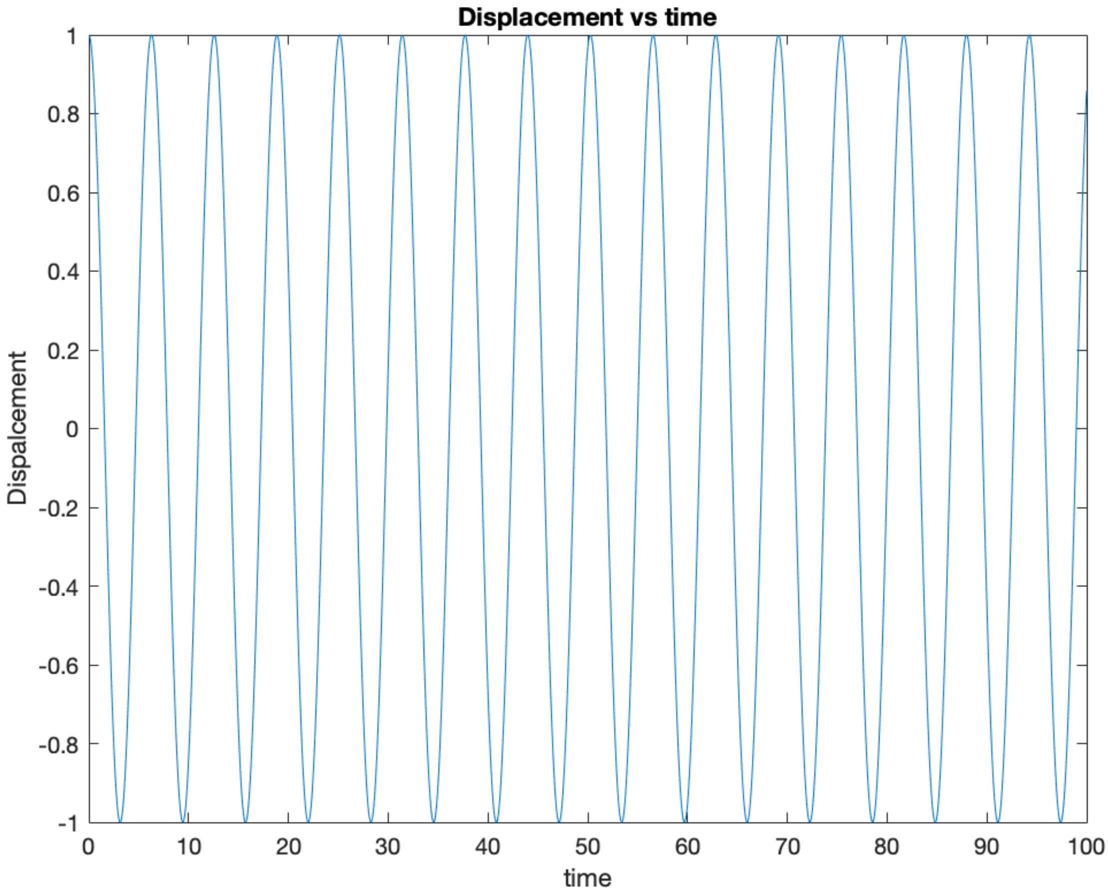
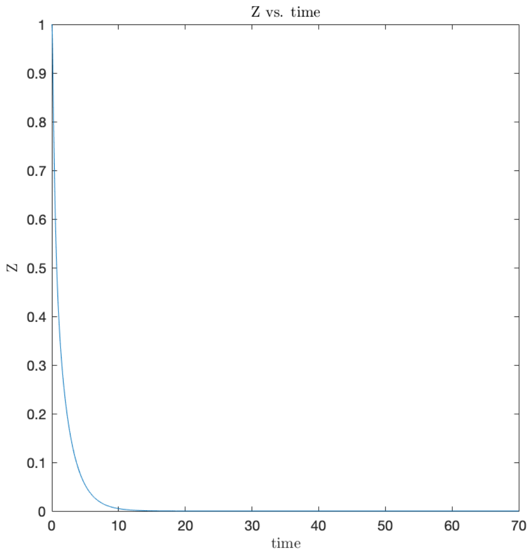
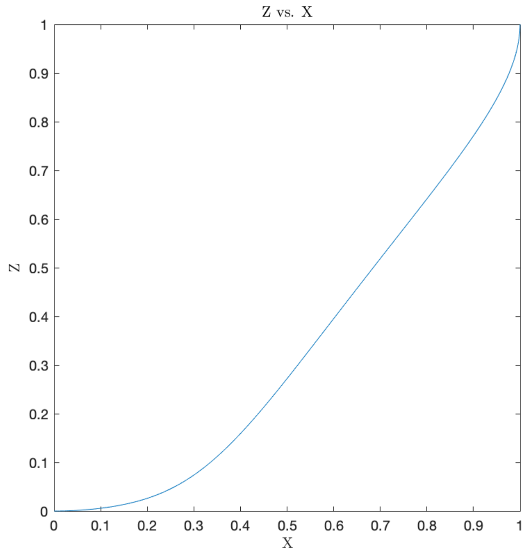
Upload your result (displacement vs. Time plot) for the SHM equation (used to test your code)
I used the equation $\begin{cases} \frac{dv}{dt} = -x \\ \frac{dx}{dt} = v \end{cases}$ with initial conditions $x(0) = 1;\ v(0) = 0$. The following displacement vs. time plot was obtained. 

Write your results here

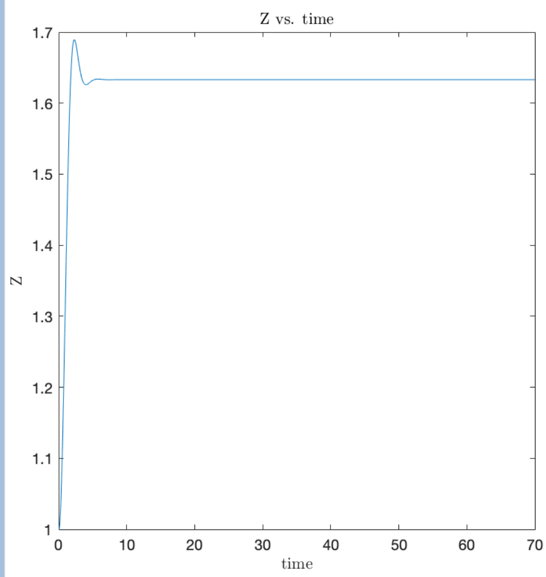
<table>
<tr><th>Parameters</th><th>Place Z vs. Time & Z vs. X figures here. Also describe the results.</th></tr>
<tr><td>r = 0.5 , p = 10 , b = 8/3</td><td>

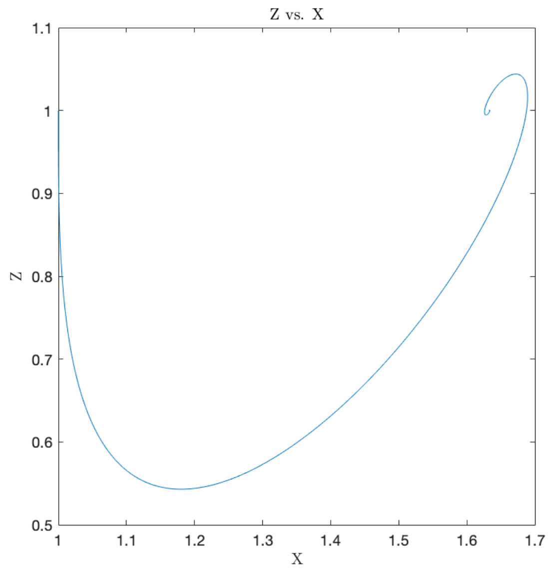




At low values of r, we find that $Z = 0$. This means that the deviation from the linearity of temperature goes to zero over time, which can be seen in the graph on the left.

</td></tr>
<tr><td>r = 2 , p = 10 , b = 8/3</td><td>





In this case, we find that over time the temperature deviation from linearity settles to a non-trivial value. Therefore, it is expected that the phase plot must begin to show signs of non-linear behaviour which is evident in the plot on the right.

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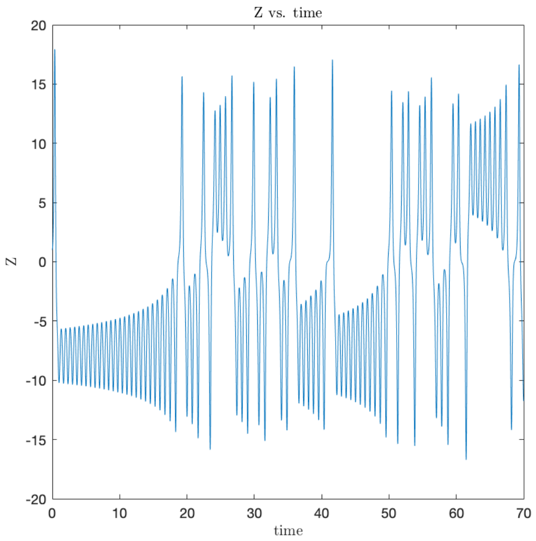
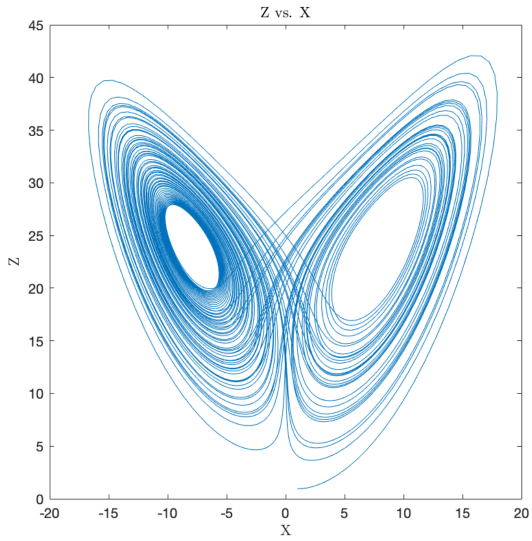
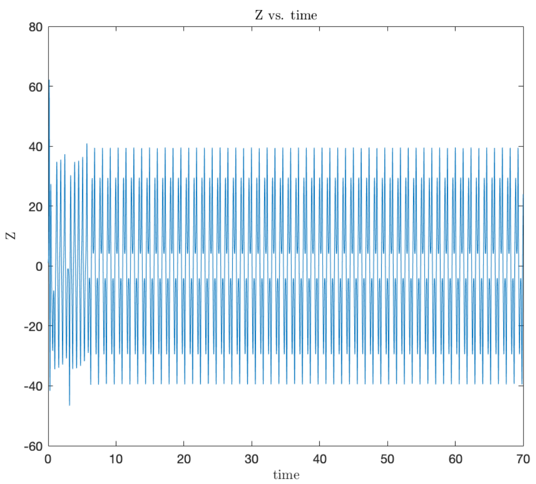
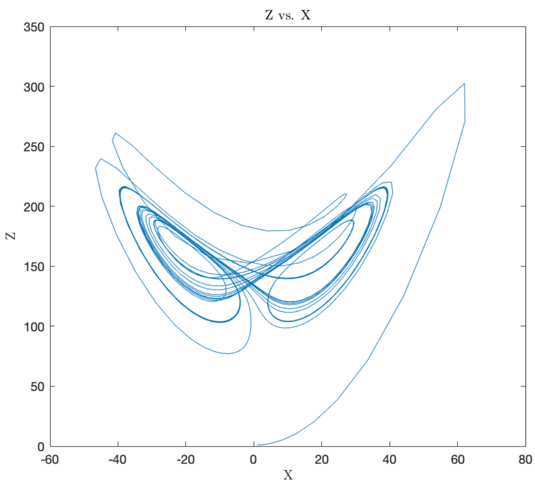
</table>

r = 25 , p = 10 , b = 8/3	  Here, after an initial period of stable increase, the value of Z settles to an irregular oscillation that does not repeat exactly. The system is now inherently chaotic and the phase space plot now shows the famous butterfly wing pattern.
r = 160 , p = 10 , b = 8/3	  At $r = 160$ the chaotic behaviour seems to fall. The value of Z now varies periodically and the phase space plot displays signs of low chaotic behaviour.

If you did not get any results, then describe the progress that you made neverthless towards solving the problem and at what point you got stuck.

NA