Math 330 HW 2

In this homework assignment, you are asked to do some numerical explorations on the Van Der Pol equation

\[ x'' + \mu(x^2 - 1)x' + x = 0. \]

1. Numerically determine the period \( T \) of the limit cycle for \( \mu = 0 : 0.05 : 0.5 \), and \( \mu = 5 : 5 : 50 \), i.e., \( \mu = 0, 0.05, 0.1, \ldots, 0.45, 0.5 \) and \( \mu = 5, 10, 15, \ldots, 45, 50 \).

2. Can you do data fitting and come up with formulas for \( T \) versus \( \mu \) when \( \mu \ll 1 \) and \( \mu \gg 1 \)?

Note: You can use either

\[
\begin{cases}
  x' = y \\
  y' = -x - \mu(x^2 - 1)y
\end{cases}
\]

or

\[
\begin{cases}
  x' = \mu\{y - (\frac{1}{3}x^3 - x)\} \\
  y' = -\frac{1}{\mu}x
\end{cases}
\]

in your numerics.