1) By using polar coordinates, prove that the system
\[
\begin{align*}
y' &= y + x - y(x^2 + y^2) \\
x' &= x - y - x(x^2 + y^2)
\end{align*}
\]
has a unique periodic solution.

2) Consider the following system in \( \mathbb{R}^2 \) written in polar coordinates
\[
\begin{align*}
r' &= r(1 - r) \\
\theta' &= \sin^2(\theta/2)
\end{align*}
\]
determine the attraction properties of \((0, 0)\) and \((1, 0)\).

3) Find all periodic solutions of
\[
s^{(4)} + 2s'' + s = 0
\]