Math 2920 – Fall 2017
Homework 6

Problems 6.12, 6.13, 7.1, 7.13

Problem 6.A

Compute the Poincare map $\mathcal{P}_\Sigma$ for $\Sigma = \{(x, y) \in \mathbb{R}^2 \mid x > 0, y = 0\}$ and for the vector field defined by the system

\[
\begin{align*}
\dot{x} &= y + x(1 - \sqrt{x^2 + y^2}) \\
\dot{y} &= -x + y(1 - \sqrt{x^2 + y^2})
\end{align*}
\]

Problem 6.A

Use Poincare-Bendixson theorem to show that the system has a periodic solution

\[
\begin{align*}
\dot{x} &= x - y - x^3 \\
\dot{y} &= x + y - y^3
\end{align*}
\]