1. Reduce the system
\[
\begin{align*}
2y'_1 + y'_2 &= y_1^2 + y_2^2 \\
y'_1 + y'_2 &= -2y_1y_2
\end{align*}
\]
to the form
\[
\begin{align*}
y'_1 &= f_1(y_1, y_2) \\
y'_2 &= f_2(y_1, y_2)
\end{align*}
\]

2. Find a solution \( \phi \) of the system
\[
\begin{align*}
y'_1 &= -y_1 \\
y'_2 &= y_1 + ty_2
\end{align*}
\]
satisfying the initial condition \( \phi (0) = (2, 1) \).

3. Find all continuous nonnegative functions \( f : [0, 1] \to \mathbb{R} \) such that
\[
f(t) \leq \int_0^t f(s)ds, \quad 0 \leq t \leq 1.
\]

4. (a) Given that
\[
A(t) = \begin{pmatrix} 0 & 1 \\ -2/t^2 & 2/t \end{pmatrix},
\]
show that
\[
\Phi(t) = \begin{pmatrix} t^2 & t \\ 2t & 1 \end{pmatrix}
\]
is a fundamental matrix for the system
\[
y' = A(t)y,
\]
on any interval \( I \) not including the origin.

(b) Explain why \( \det \Phi(0) = 0 \) does not contradict the fact that \( \Phi(t) \) is a fundamental matrix.