1)

a) $\dot{x} = -g(t)x^5$, $g(t) \geq 1 \quad \forall t \geq t_0$ is GUES

Let $V(x) = \frac{1}{2}x^2$

$\dot{V}(x) = x(-g(x)x^5) < 0$ ← GUES (Need to do comp func. For E)

b) $\dot{x} = -g(t)x$, $g(t) \geq 1 \quad \forall t \geq t_0$

Let $V(x) = \frac{1}{2}x^2$

$\dot{V}(x) = x(-g(t)x) < 0$ ← GUES (Need to do comp func For E)

c) LTI w/ A having $|\Re\{\lambda_i(A)\}| < 0 \; \forall i$ is Exponentially stable. True

A is Hurwitz

$A = \Psi\Psi^T$

2) $\dot{\hat{\theta}}(t) = \overline{\Psi(t)\Psi^T(t)}\hat{\theta}(t) - \Psi(t)\overline{y(t)}$

$\theta = \begin{bmatrix} \theta_1 \\ \theta_2 \end{bmatrix}$

$y(t) = \theta_1 + 2\theta_2$

$C = [1 \quad 2]$

$A = \Psi\Psi^T \rightarrow \Phi = e^{-At}$

Assuming $\Psi(t)$ is persistantly exciting

The Parameters θ cand be found