2. (a) $u_t = E(x_t) = E(W_t) + kE(W_{t-1}) + \cdots + kE(W_0) = 0$

$\gamma(s,t)$: if $h=0$, $\gamma(s,t) = E(x_t^2) = (1+k^2+k^2+\cdots+k^2)\sigma_w^2 = (1+tk^2)\sigma_w^2$

if $h=1$, $\gamma(s,t) = E(x_t x_{t-1}) = (k+k^2+\cdots+k^2)\sigma_w^2 = (k+(t-1)k^2)\sigma_w^2$

if $h=2$, $\gamma(s,t) = E(x_t x_{t-2}) = (k+k^2+\cdots+k^2)\sigma_w^2 = (k+(t-2)k^2)\sigma_w^2$

...

if $h=t$, $\gamma(s,t) = E(x_t x_0) = k\sigma_w^2$

if $h>t$, $\gamma(s,t) = 0$

As we can see, $\gamma(s,t)$ depends on h and t, so it is not stationar

(b) $\nabla x_t = x_t - x_{t-1}$

$= W_t + kW_{t-1} + kW_{t-2} + \cdots + kW_0 - W_{t-1} - kW_{t-2} - \cdots - kW_0$

$= W_t + (k-1)W_{t-1}$

$u_t = E(\nabla x_t) = E(W_t) + (k-1)E(W_{t-1}) = 0$

$\gamma(s,t)$: if $h=0$, $\gamma(s,t) = E(\nabla x_t^2) = (1+(k-1)^2)\sigma_w^2$

if $h=1$, $\gamma(s,t) = E(\nabla x_t \nabla x_{t-1}) = (k-1)\sigma_w^2$

if $h\geq 2$, $\gamma(s,t) = 0$.

Since $u_t = 0$ and $\gamma(s,t)$ only depends on h, it is stationary.