Problem 2

Here we have $A = I$, $B = I$, $H = I$

For time update:

$$\hat{x}_k^- = I\hat{x}_{k-1} + Iu_{k-1} = \hat{x}_{k-1} + u_{k-1}$$
$$P_k^- = IP_{k-1}I^T + Q = P_{k-1} + Q$$

For measurement update

$$K_k = P_k^- I^T (IP_K^- I^T + R)^{-1} = P_k^- (P_k^- + R)^{-1}$$
$$\hat{x}_k = \hat{x}_k^- + K_k(z_k - I\hat{x}_k^-) = \hat{x}_k^- + K_k(z_k - \hat{x}_k^-)$$
$$P_k = (I - K_k I)P_k^- = (I - K_k)P_k^-$$