Quiz 2

Q1 intrinsic param

```
% given params
principle_point = [682 498];
focal_length = 900;
T = 0.25;
left_im = [1056 498];
right_im = [808 498];

% dist to principle point
% pos = [x y]
left_pos = [(left_im(1) - principle_point(1)) (left_im(2) - principle_point(2))];
right_pos = [(right_im(1) - principle_point(1)) (right_im(2) - principle_point(2))];

% calc baseline of cameras
Base = T*1000;

% calculate cartesian values
z = (Base*focal_length)/(left_pos(1) - right_pos(1));
x = (z*left_pos(1))/focal_length;
y = (Base*left_pos(2))/(left_pos(1) - right_pos(1));

% final answer
final_pos = [x y z]
```

```
final_pos =
  (377.0161, 0,  907.2581)
```

Q2 Linear Discrete-Time System

a)

$$x(k) = A^k_{X_o} + \sum_{i=0}^{k-1} A^i \times Bu(k-1-i)$$

b) **Analyze the stability of the system**

det(λI - A) = 0

| λ | 0 | - | -1 | 2| | = | 0

| 0 | λ | - | 0 | -3|

| λ+1 | 0-2 | | = | 0

| 0 | λ+3|

(λ+1)(λ+3) – (0)(-2) = 0

therefore poles are:
λ1 = -1 and
λ2 = -3

System is unstable as |λ2| > 1

c) analyze the controllability
Ct = [B AB]

| 0 -1 2 * 0|
|1 0 -3 * 1|

= |0 2|
|1 -3|

rank = 2

Since both rows are independent of each other, the system is full rank and hence is controllable