

%% Exercise 1.2

```
clear
clc
```

% Define A matrix

```
A = sym( [ ...
    754    0  -377; ...
    0    754   377; ...
    377  -377    0; ...
]);
```

% Define B matrix

```
B = sym( [ ...
    47.1250    0; ...
    0    47.1250; ...
    0    0; ...
]);
```

% Compute controllability matrix and rank

```
C_AB = [B A*B A^2*B]
```

C_AB =

$$\begin{pmatrix} \frac{377}{8} & 0 & \frac{142129}{4} & 0 & \frac{160747899}{8} & \frac{53582633}{8} \\ 0 & \frac{377}{8} & 0 & \frac{142129}{4} & \frac{53582633}{8} & \frac{160747899}{8} \\ 0 & 0 & \frac{142129}{8} & -\frac{142129}{8} & \frac{53582633}{4} & -\frac{53582633}{4} \end{pmatrix}$$

```
rref(C_AB)
```

ans =

$$\begin{pmatrix} 1 & 0 & 0 & 754 & -142129 & 710645 \\ 0 & 1 & 0 & 754 & 142129 & 426387 \\ 0 & 0 & 1 & -1 & 754 & -754 \end{pmatrix}$$