

1)

```
>> A = [3 1; 1 -3; 2 -1]
A =
```

```
     3     1
     1    -3
     2    -1
```

```
>> A_pinv = inv(A'*A)*A'
A_pinv =
```

```
     0.2333     0.0333     0.1333
     0.1333    -0.2667    -0.0667
```

```
>> format rat
```

```
>> A_pinv
A_pinv =
```

```
     7/30     1/30     2/15
     2/15    -4/15    -1/15
```

2)

```
>> A_pinv
A_pinv =
```

```
     7/30     1/30     2/15
     2/15    -4/15    -1/15
```

```
>> b = [-1;2;1]
b =
```

```
    -1
     2
     1
```

```
>> x_ls = A_pinv*b
x_ls =
```

```
    -1/30
   -11/15
```

4)

```
>> A = [4 6;2 3]
A =
```

```
     4     6
     2     3
```

```
>> b = [3; -2]
b =
```

```
     3
    -2
```

```
>> A_pinv = pinv(A)
```

```
A_pinv =
```

$\frac{4}{65}$	$\frac{2}{65}$
$\frac{6}{65}$	$\frac{3}{65}$

```
>> A_pinv*b
ans =
```

```

      8/65
     12/65
>> A = [1 2 -2; 2 4 -4; -1 -2 2]
A =
```

1	2	-2
2	4	-4
-1	-2	2

```
>> b = [2;0;-1]
b =
```

2
0
-1

```
>> A_pinv = pinv(A)
A_pinv =
```

$\frac{1}{54}$	$\frac{1}{27}$	$-\frac{1}{54}$
$\frac{1}{27}$	$\frac{2}{27}$	$-\frac{1}{27}$
$-\frac{1}{27}$	$-\frac{2}{27}$	$\frac{1}{27}$

```
>> x_ls = A_pinv*b
x_ls =
```

$\frac{1}{18}$
$\frac{1}{9}$
$-\frac{1}{9}$

5)

```
>> A_pinv = [1/sqrt(2) 1/sqrt(2) 0; 0 0 1; -1/sqrt(2) 1/sqrt(2) 0]*[1/2 0 0;
0 1/sqrt(2) 0; 0 0 1/sqrt(2)]*[1/sqrt(2) 0 1/sqrt(2); 0 -1 0; -1/sqrt(2) 0 1/
sqrt(2)]
A_pinv =
```

$\frac{1}{4}$	$-\frac{1}{2}$	$\frac{1}{4}$
$-\frac{1}{2}$	0	$\frac{1}{2}$
$-\frac{1}{4}$	$-\frac{1}{2}$	$-\frac{1}{4}$

```
>> A = [1 -1 -1;-1 0 -1; 1 1 -1]
A =
```

1	-1	-1
-1	0	-1
1	1	-1

```
>> A*A_pinv
ans =
```

1	0	0
0	1	0

0

0

1