Finding partial fractions using MATLAB

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Exercise 1

Let $F(S) = \frac{N(S)}{D(s)} = \frac{2S^3 + 5S^2 + 3S + 6}{S^3 + 6S^2 + 11S + 6}$,

Then,

N(S) = $2S^3 + 5S^2 + 3S + 6$

D(S) = $S^3 + 6S^2 + 11S + 6$

Numerator(b) = $[2, 5, 3, 6]$,

Denominator(a) = $[1, 6, 11, 6]$

```
b=[2 5 3 6];
a=[1 6 11 6];
```

By Using **MATLAB residue** function

$[r, p, k] = residue(num, den)$

```
[r,p,k]=residue(b,a);
display(r);
```

```
r = 3×1
   -6.0000
   -4.0000
    3.0000
```

```
display(p);
```

```
p = 3×1
   -3.0000
   -2.0000
   -1.0000
```

```
display(k);
```

```
k = 2
```

r = vectors of zeros = [-6, -4, 3]

p = vectors of poles = [-3, -2, -1]

k = polynomials=[2]

Therefore,

$$F(S) = 2 - \frac{6}{S+3} - \frac{4}{S+2} + \frac{3}{S+1}$$

Exercise 2

$$F(S) = \frac{N(S)}{D(s)} = \frac{S^2 + 2S + 3}{S^3 + 3S^2 + 3S + 1}$$

Numerator(b1) = $[1, 2, 3]$,

Denominator(a1) = $[1, 3, 3, 1]$

```
b1=[1 2 3];
a1=[1 3 3 1];
```

By Using **MATLAB residue** function

```
[r1,p1,k1]=residue(b1,a1);
display(r1);
```

```
r1 = 3×1
    1.0000
    0.0000
    2.0000
```

```
display(p1);
```

```
p1 = 3×1
   -1.0000
   -1.0000
   -1.0000
```

```
display(k1);
```

```
k1 =

     []
```

r = vectors of zeros = [1, 0, 2]

p = vectors of poles = [-1, -1, -1]

k = polynomials=[0]

Therefore,

$$F(S) = 0 + \frac{1}{S+1} + \frac{0}{(S+1)^2} + \frac{2}{(S+1)^3}$$

$$F(S) = \frac{1}{S+1} + \frac{2}{(S+1)^3}$$