MATLAB Exercise

- The MATLAB command ***residue*** can be used to obtain partial-fraction expansion of $N(s)/D(s)$. Consider the function

$$\frac{N(s)}{D(s)} = \frac{num}{den} = \frac{b_n s^n + b_{n-1}s^{n-1} + \cdots + b_0}{a_n s^n + a_{n-1}s^{n-1} + \cdots + a_0}$$

where some of a_i and b_i may be zero. The command,

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

finds the residues, poles and direct terms of the partial fraction expansion of $\frac{N(s)}{D(s)}$

$$\frac{N(s)}{D(s)} = \frac{r(1)}{s - p(1)} + \frac{r(2)}{s - p(2)} + \cdots + \frac{r(n)}{s - p(n)} + k(s)$$

num and den are row vectors of equal length as follows:

$$\text{num} = [b_n \;\; b_{n-1} \;\; \cdots \;\; b_0]$$
$$\text{den} = [a_n \;\; a_{n-1} \;\; \cdots \;\; a_0]$$

1. Using MATLAB, find the partial fraction expansion of the following function.

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

2. Expand the following $B(s)/A(s)$ into partial fractions with MATLAB.

$$\frac{B(s)}{A(s)} = \frac{s^2 + 2s + 3}{s^3 + 3s^2 + 3s + 1}$$