

## MATLAB Exercise 6 – Polynomial

1. Generate the following polynomials as row vectors

1)  $f = x^5 + 3x - 4$

2)  $f = x^3$

3)  $f = x(x-1)(x+3)$

4)  $\begin{vmatrix} x-1 & 2 \\ 3 & x+4 \end{vmatrix}$

2. Represent polynomial  $f = (x-1)(x-2)(x-3)$  in the following forms

1) row vector

2) sym

3) pretty

4)

3. Evaluate the polynomial  $f = (x-1)(x-2)(x-3)$  at

1) point 4

2) point 1 to 10

4. Execute following codes compare the results and the difference between **subs** and **polyvalm**.

Why? Here `eye(2)` means `[1 0; 0 1]`

1) `>> syms x; mat = eye (2); sym_pol_a = x^2+1; subs(sym_pol_a, mat)`

2) `>> clear; mat = eye (2); pol_a = [1 0 1]; polyvalm(pol_a, mat)`

3) replace the code `pol_a = [1 0 1]` with `syms x; pol_a = x^2+1` in 2). How about the result? Why? How to correct it if `pol_a = x^2+1` should be used?

5. Let  $f(x) = x^2 + x - 4$ ,  $g(x) = 2x^2 + 1$ . Compute

1)  $f(x) + g(x)$       2)  $f(x)g(x)$       3)  $f(g)$       4)  $\frac{f(x)}{g(x)}$

**Help** In command window input **help conv(or deconv)**, learn the different usage of this function

6. Let  $f(x) = x^2$ ,  $g(x) = 3x^5 + 1$ . Compute following formula by two different methods (i.e. operations of matrix & operations of sym objects).

1)  $f(x) + g(x)$       2)  $f(x)g(x)$

7. Please display the result of Ex6

1) sym form and the terms ordered by descending powers

2) as row vector

8. Generate matrices which are

1) a symmetric positive definite matrix

2) a symmetric positive semi-definite matrix

and check the matrices by **roots** function and `'` operation.

9. Compute the quotient and remainder of  $\frac{f(x)}{g(x)}$  and display the results in sym form, where

$$f(x) = x^5 + 2x^4 - 3x^3 - x^2 - 2x + 3, g(x) = x^4 + x^3 - 5x^2 - 6.$$

10. \*Try to compute the greatest common factor (最大公因式) of  $f(x)$  and  $g(x)$  in Ex9.