

Matlab Programming Symbolic Toolbox^{1 2}

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¹*Matlab, An Introduction with Applications, 2nd ed.* by Amos Gilat

²*Matlab Guide, 2nd ed.* by D. J. Higham and N. J. Higham

- Symbolic operations can be performed in Matlab using the Symbolic Toolbox
- Initiate symbolic variable

```
syms variable1 variable2 variable 3
```

- Example:

```
>>syms x  
>> f = x.^2+2*x;
```

Helpful Commands

- `collect`: collects the terms in the expression that have the same power

```
>>collect((x^2 + x-exp(x))*(x+3))  
ans =  
x^3+4*x^2+(-exp(x)+3)*x-3*exp(x)
```

- `expand`: expands expression in two ways. It carries out products of terms that include summation and it uses trigonometric identities and exponential and logarithmic laws to expand corresponding terms

```
>>expand((x+2)*(x-4))  
ans =  
x^2-2*x-8
```

Helpful Commands

- `factor`: changes an expression that is a polynomial to be a product of polynomials of a lower degree

```
>>factor(x^2-2*x-8)
ans =
(x+2)*(x-4)
```

- `simplify`: generates a simpler form a the expressions

```
>>simplify(x*x*(x-2))
ans =
x^2*(x-2)
```

- `pretty`: displays expression in a format resembling the mathematical format in which expressions are generally typed

```
>>pretty(x^2/3)
```

- `subs`: substitutes the unknown with a known

```
>>syms t; f = t.^2+3*t;  
>>subs(f,t,2)  
ans=  
10
```

- `diff`: calculates the derivative

```
>>diff(f)  
ans=  
2*t+3
```

- `int`: calculates the integral

```
>>int(f)  
ans=  
1/3*t^3+3/2*t^2
```

Functions using the Symbolic Toolbox

```
function fsubs = testin(f,subsx)
% This function substitutes the x
% in the symbolic function f(x) for subsx
% In other words, it calculates f(subsx)
syms x
fsubs = subs(f,x,subsx);
```

Note:

- The function submitted must be in terms of a symbolic variable x . In other words,

$$f = f(x)$$

- The first line of code is `syms x`