

MATLAB/Simulink Session 2

Part 1

Symbolic Calculations

```
% define symbolic functions  
syms x f(x)  
f(x) = x^2
```

$$f(x) = x^2$$

```
f(5)
```

```
ans = 25
```

```
syms x y f(x,y)  
f(x,y) = x^2 + y^2
```

$$f(x, y) = x^2 + y^2$$

```
f(3,4)
```

```
ans = 25
```

Derivative Calculations

```
% derivative  
diff(f, x, 1)
```

$$\text{ans}(x, y) = 2x$$

```
diff(f, x, 2)
```

$$\text{ans}(x, y) = 2$$

```
diff(f, y, 1)
```

$$\text{ans}(x, y) = 2y$$

```
% derivative  
syms x f(x)  
f(x) = cos(x)
```

$$f(x) = \cos(x)$$

```
diff(f, 1)
```

$$\text{ans}(x) = -\sin(x)$$

Define and Solve Differential Equations

```
% diff equation
syms y(t) a
eqn = diff(y,t) == a*y;
dsolve(eqn)
```

$$\text{ans} = C_1 e^{at}$$

```
dsolve('Dy = a*y') % dy = ay
```

Warning: Support of character vectors and strings will be removed in a future release. Use sym objects to define differential equations instead.

$$\text{ans} = C_1 e^{at}$$

```
dsolve('Dy = y^2 + 1')
```

Warning: Support of character vectors and strings will be removed in a future release. Use sym objects to define differential equations instead.

$$\text{ans} = \begin{pmatrix} \tan(C_1 + t) \\ i \\ -i \end{pmatrix}$$

```
dsolve('Dy = y^2 + 1' , 'y(0) = 1')
```

Warning: Support of character vectors and strings will be removed in a future release. Use sym objects to define differential equations instead.

$$\text{ans} = \tan\left(t + \frac{\pi}{4}\right)$$

```
dsolve('D2y = 3*Dy')
```

Warning: Support of character vectors and strings will be removed in a future release. Use sym objects to define differential equations instead.

$$\text{ans} = C_1 + C_2 e^{3t}$$

```
dsolve('D2y = 4*Dy - 4*y', 'y(0) = 3', 'Dy(0) = -6')
```

Warning: Support of character vectors and strings will be removed in a future release. Use sym objects to define differential equations instead.

$$\text{ans} = 3e^{2t} - 12te^{2t}$$

```
dsolve('D2y = -3*Dy - 2*y', 'y(0) = 0', 'Dy(0) = 2')
```

Warning: Support of character vectors and strings will be removed in a future release. Use sym objects to define differential equations instead.

$$\text{ans} = 2 e^{-2 t} (e^t - 1)$$