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)
```

ans(x, y) = $2\,x$

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

ans(x, y) = 2

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

ans(x, y) = $2\,y$

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

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

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

```
ans(x) = $-\sin(x)$
```

Define and Solve Differential Equations

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

ans = $C_1 e^{at}$

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

ans = $C_1 e^{at}$

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

ans =

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

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

ans =

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

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

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

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

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

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

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