

## MATH.2360 Engineering Differential Equations More MATLAB Graphics Commands

### A. The *subplot* command

The *subplot* command allows you to create a single figure containing multiple plot windows. The command *subplot(m,n,p)* opens a figure with an  $m \times n$  array of windows, and it activates window number  $p$ . (Windows are numbered left to right, starting in the first row, then moving to the second row, etc.) You can then issue commands to generate a plot in window number  $p$ .

Try the following commands. Do not close the figure until after you enter the last command.

```
subplot(2,2,1)
x=linspace(-10,10,100);
y=2*x;
plot(x,y)
subplot(2,2,2)
x=linspace(-3,3,100);
y=x.^2;
plot(x,y)
subplot(2,2,3)
x=linspace(-2,2,100);
y=x.^3;
plot(x,y)
subplot(2,2,4)
y=x.^4;
plot(x,y)
```

### B. The *plotyy* command

Sometimes you might want to plot two quantities with different units and different magnitudes on the same set of axes. For example, suppose you wanted to plot both temperature (in °C) and atmospheric pressure (in millibars) at Logan Airport as functions of time for one day. Try the following commands. Do not close the figure until after you enter the last command.

```
t = linspace(0,24,100);
T = 20-5*cos(2*pi*t/24);
p = 1000+20*(t/24).^2;
[AX] = plotyy(t,T,t,p);
ylabel(AX(1),'Temperature ( ^\circC)')
ylabel(AX(2),'Pressure (mbars)')
xlabel('Time (hours)')
title('Temperature and Air Pressure at Logan Airport, Midnight 2/30/99 - Midnight 2/31/99')
```

**C. Extra Credit Exercises** (5 points added to your homework point total for each exercise. Due March 29. Please copy both figures into a Word document and email me the document as an attachment: [stephen\\_pennell@uml.edu](mailto:stephen_pennell@uml.edu))

1. Generate a figure with a  $2 \times 3$  array of windows. In the 6 windows graph the following 6 function over the interval  $-2 \leq x \leq 2$ :  
 $y = e^x, y = e^{-x}, y = \sinh(x), y = \cosh(x), y = \tanh(x)$ , and  $y = \operatorname{sech}(x)$ . MATLAB knows the hyperbolic functions.
2. Suppose the height of a falling object (in meters) is given by  $y = 490 - 4.9t^2$  where  $t$  denotes time (in seconds). Use *plotyy* to plot the height and velocity of the object for  $0 \leq t \leq 10$ . Label all axes and include a title containing your name.