

Homework A: MatLab Programming Practice

Under Matlab environments, try to figure out the results of the following exercises.

1. linspace(a,b,n)

- (a) linspace(0,10,11) (b) linspace(0,10,51)
(c) linspace(-12,12,25) (d) linspace(10,1,10)

2. eye, ones, triu, tril

- (a) $3 \times \text{eye}(4,4) - (\text{ones}(4,4) - \text{triu}(\text{ones}(4,4), 2) - \text{tril}(\text{ones}(4,4), -2))$
(b) $\text{eye}(5,5) - \text{tril}(\text{ones}(5,5), -1) + [1, 1, 1, 1, 0]' * [0, 0, 0, 0, 1]$

3. cos, sin, mesh, meshgrid

```
R=linspace(0,5,20);
Theta=linspace(0,2*pi,11);
X=R'*cos(Theta);
Y=R'*sin(Theta);
t=linspace(-5,5,20);
[X Y]=meshgrid(t,t);
Z=2+X.^2+Y.^2;
mesh(Z)
title('An example of mesh plot')
xlabel('r*cos(x)')
ylabel('r*sin(x)')
```

3x. Format and Random Number Generator

```
C=fix(random('Binomial',12,0.6,2,2))
D=inv(C)
format rat
E=inv(C)
format long
F=inv(C)
```

4. 100-meter race

```
% Modelling the race for 100-meter athletes
fin=fopen('sprint.dat','r');
m=3; n=11; % fgetL(fin); skip one input line
A=fscanf(fin,'%f',[m n]);
X=0:10:100; % X=linspace(0,100,11);
for i=1:n
    Y0(i)=A(1,i); Y1(i)=A(2,i); Y2(i)=A(3,i);
% Y0=A(1,:);
end
a=14.4; tau=0.739;
T=0:0.2:10; % T=linspace(0,10,21);
for j=1:51
    t=0.2*(j-1);
    X1(j)=a*tau*(t-tau*(1-exp(-t/tau)));
end
plot(T,X1,'g-',Y1,X,'bo',Y2,X,'rx'); ...
axis([0,10, 0,100]); grid
legend('Model','Carl Lewis','Ben Johnson',2)
title('A model for athletes in a race')
xlabel('Time in seconds')
ylabel('Running distance in meters')
```

5. Fast Fourier Transform (FFT)

```
% fftBox.m - Fourier Transform for the Box function
X1=linspace(0,1,17); % X1=0:1/16:1;
X2=linspace(1,16,241); % X2=1:1/16:16;
Y1=ones(1,length(X1));
Y2=zeros(1,length(X2));
X=[X1 X2]; Y=[Y1 Y2];
W=abs(fftshift(fft(Y)));
subplot(2,1,1)
plot(X,Y,'r'); axis([0 16, 0,1.2])
title('Box function')
subplot(2,1,2)
plot(W,'b-');
title('Fourier Spectrum of Box function')
```