

CIEG 675 HW #2 solutions

% Homework 2 solutions (cut and paste into matlab to test)

%%%% Prob 1 %%%%

```
prob1 = 5*ones(5,5);
prob1(3,3) = 1; % a 5x5 matrix of all 5 except at center
```

%%%% Prob 2 %%%%

```
prob2a=[1 2 3 4];
prob2b=prob2a;
elementwise = prob2a.*prob2b; % element wise multiplication
```

%%%% Prob 3 %%%%

```
prob3 = prob2a*prob2b'; % matrix multiplication requires the second to be trasnposed.
```

%%%% Prob 4 %%%%

```
prob4 = [1 2 3; 4 5 6; 7 8 9];
prob4a = exp(sqrt((40+prob4)/7 - 2));
```

%%%% Prob 5 %%%%

```
T = 10; %wave period
t=0:1/10:20; % time;
amp=1; % amplitude
wave = amp * sin(2*pi*t/T); % the sine wave
```

%%%% Prob 6 %%%%

```
x=1:10;
y=x;
[X,Y]=meshgrid(x,y);
X=X(:); % turns the matrix into a long vector instead;
Y=Y(:); % turns the matrix into a long vector instead;
data=cumsum(ones(10,10))+(1-rand(10,10)); % elevation data
data=data(:); % turns the matrix into a long vector instead;
```

```
A(:,1) = ones(length(X),1); % the constant in the least squares regression
```

```
A(:,2) = X'; % the x values
```

```
A(:,3) = Y'; % the y values
```

```
% we need to set up the matrix equation Ap=data; where p are the coefficients
```

```
% and solve it. Use the left divide
```

```
p = A\data;
```

```
% to see the results, reconstruct the data;
```

```
data_fit=p(1) + p(2)*X + p(3)*Y;
```

```
data_fit=reshape(data_fit,10,10); % we will learn about the later

plot3(X,Y,data,'); % we will learn more about this later
hold on
surf(x,y,data_fit); % we will learn more about this later

%% click on the circular arrow at the top of the figure window to change
%% perspective.

%%%% Prob 7 %%%
x = 1;
y = 1; % the vector to be rotated

% the rotation matrix can be found from any linear algebra book and relies
% on sines and cosines
% rotated vector = transformation matrix * [x y]';

ang = 45*pi/180; % the angle to be rotated through
rot_vector = [cos(ang) -sin(ang); sin(ang) cos(ang)] * [x y]';
```