1. (30 points) Let a and x_i be vectors and b_i be a scalar for all I. Assume vector a is the only unknown. Consider the following mean square error

$$E(\mathbf{a}) = \frac{1}{2n} \sum_{i=1}^{n} (\mathbf{x}_i^T \mathbf{a} - b_i)^2$$

   A. $\frac{dE}{da}$=?
   B. Set $\frac{dE}{da}$ to zero and find a.
   C. Express the updating rule of the gradient descent method for minimizing the mean square error.
2. (20 points) Draw a flow chart to illustrate minimizing E(a) by the gradient descent method.
3. (20 points) Implement your flow chart by Matlab codes.
4. (30 points) Use the following codes to generate x and z and apply codes in 3 to reconstruct linear transformation that translates x to z.

   Checked by_____time_____

   A.

```
x=rand(400,1);
z= 2*x(:,1)+x(:,2)-1;
```

   B.

```
x=rand(400,2);
z(:,1) = 2*x(:,1)+x(:,2)-1;
z(:,2)=x(:,1)-x(:,2)+1;
```