※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) Find the level curve, (i.e., the gradient), of $f(x,y)=-x^2+y^2$ passing through point (2,3)?

2. (20%) Find an equation of the plane that contains (1,0,-1), (3,1,4), and (2,-2,0).

3. (20%) Find the eigenvalues λ_1, λ_2 and eigenvectors x_1, x_2 of the matrix $A = \begin{pmatrix} 3 & 4 \\ -1 & 7 \end{pmatrix}$?

4. (20%) Given following equations:
$$2x_1 - 9x_2 = 15$$
$$3x_1 + 6x_2 = 16.$$

   1) Please write them to be the format as $Ax=b$, where A is a 2x2 matrix, x is a 2x1 vector and b is also a 2x1 vector. (10%)

   2) Please solve unknown x vector by using pseudo inverse approach (i.e., least squares solution) ? (10%)

5. (20%) For Sum of Squared Differences (SSD) problem, please solve the unknown parameter $h=?$

$$\min\ E = \sum_{x \in R} \left[I(x+h) - F(x) \right]^2$$

   by giving above function and using the first order Taylor series expansion.

   1) What is the first order Taylor series expansion for $I(x+h)$? (10%)

   2) To derive the result h, you can start from $\dfrac{\partial E}{\partial h} =$　(10%)