w 55eHow You may have to open this in the word desktop app to see the full formatting.

1ai.

R2 -> R2 - 5R1

R3 -> R3 - 9R1

R2 -> R2

R3 -> R3

R3 -> R3 - R2

R1 -> R1 – 2R2

ii. In a solution of the form , the variables and are free

iii.

Geometrically, this is a plane of points passing through the point with position vector . Its surface is parallel to the vectors and .

b.

By translating, we can find the closest solution of to the vector :

Where:

Multiplying by gives:

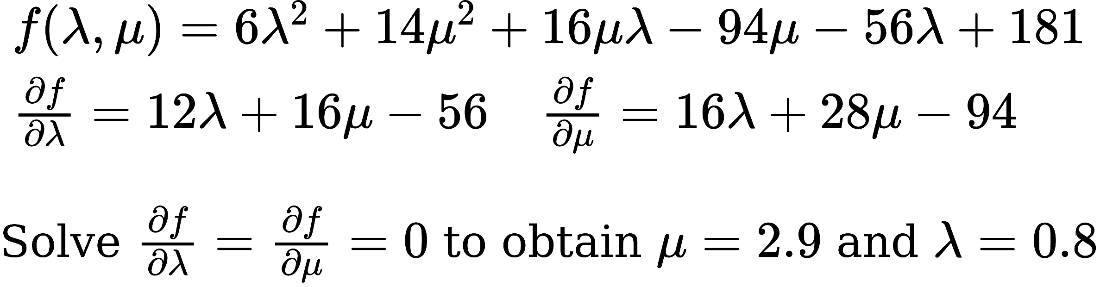
This gives the closest solution for to . To find the closest solution for to we must add the , giving:

NOTE: An alternative method (if not one recommended by the lecture notes) is to take the solution for and complete the square to solve for and as follows:

Here we can see that for the minimum , and . We can then substitute this into

We can also partially differentiate, using the premise that for the closest solution to , and to generate two simultaneous equations which can then be solved for the values of and :





ci. The rank of A is 2 and the nullity of A is 2

ii.

iii.

di.

ii.

R2 -> R2 - 2R1

R3 -> R3 - 3R1

R4 -> R4 - 4R1

R2 -> R2

R3 -> R3 + 8R2

R4 -> R4 + 12R2

R1 -> R1 - 5R2

iii.

2ai.

R4 -> R4 - R1

R3 -> R3 - R2

R1 -> R1 - R3

R4 -> R4 + R3

As can be reduced to the standard basis of , it is a basis of .

R1 -> R1 - R2

R2 -> R2 - R3

R3 -> R3 - R4

As can be reduced to the standard basis of , it is a basis of .

ii.

Reduced row echelon form

iii.

Reduced row echelon form

b.

Reduced row echelon form

ci.

For ,

For :

Reduced row echelon form

For :

Reduced row echelon form

ii.

iii.