# Optimization

## Assignment 1

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### Q1

Inserting the midpoint rule (2):

Into with eq. (1)

To parameterize the line :

Where and

Where is derived from

### Q2

The relationship between and is linear:

And is calculated using the diagram in figure (1) and the equation (\*) from the previous question in the included matlab script.

### Q3

The derivative defined in the question is the same as matlabs [Gx, Gy] = gradient(X) function.

If the X matrix is small enough calculating matrices Dx, Dy is feasible and is done using the matlab function function [Dx, Dy] = CreateDerivativeOperators(X\_rows, X\_cols)

### Q4

In the following figures we will display the images X1, X2, X3 and the magnitude of their gradients.





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### Q5

The number of unknown parameters is 5x5=25. The number of observations is 8. The rank of A is however 7.

## Q6