

# MATH60005/70005: Optimization (Autumn 22-23)

## Week 4: Gradient Method

Dr Dante Kalise  
Department of Mathematics  
Imperial College London, United Kingdom  
dkaliseb@imperial.ac.uk

Learning Outcome	Check
I understand solving $\nabla f(\mathbf{x}) = 0$ is not always feasible by hand and we need numerical methods.	
I am familiar with the idea of having an <b>iterative method</b> generating a sequence converging to a stationary point.	
I understand the gradient descent method is composed by a descent direction and a stepsize.	
I understand the three types of line search procedures presented for selecting a stepsize.	
I understand why $-\nabla f(\mathbf{x})$ is the right direction to take.	
I have checked the MATLAB examples and played with the different versions.	
I understand the basics of gradient descent algorithm (inputs, outputs, iteration, stopping).	
I understand the Lipschitz gradient property and the convergence theorem for gradient descent.	
I understand the formulation of nonlinear regression as an optimization problem and its difference with linear least squares.	
I can recognize the Gauss-Newton method as an iterative linearization of the NLS problem.	
I can establish the link between the Gauss-Newton method and gradient descent.	

