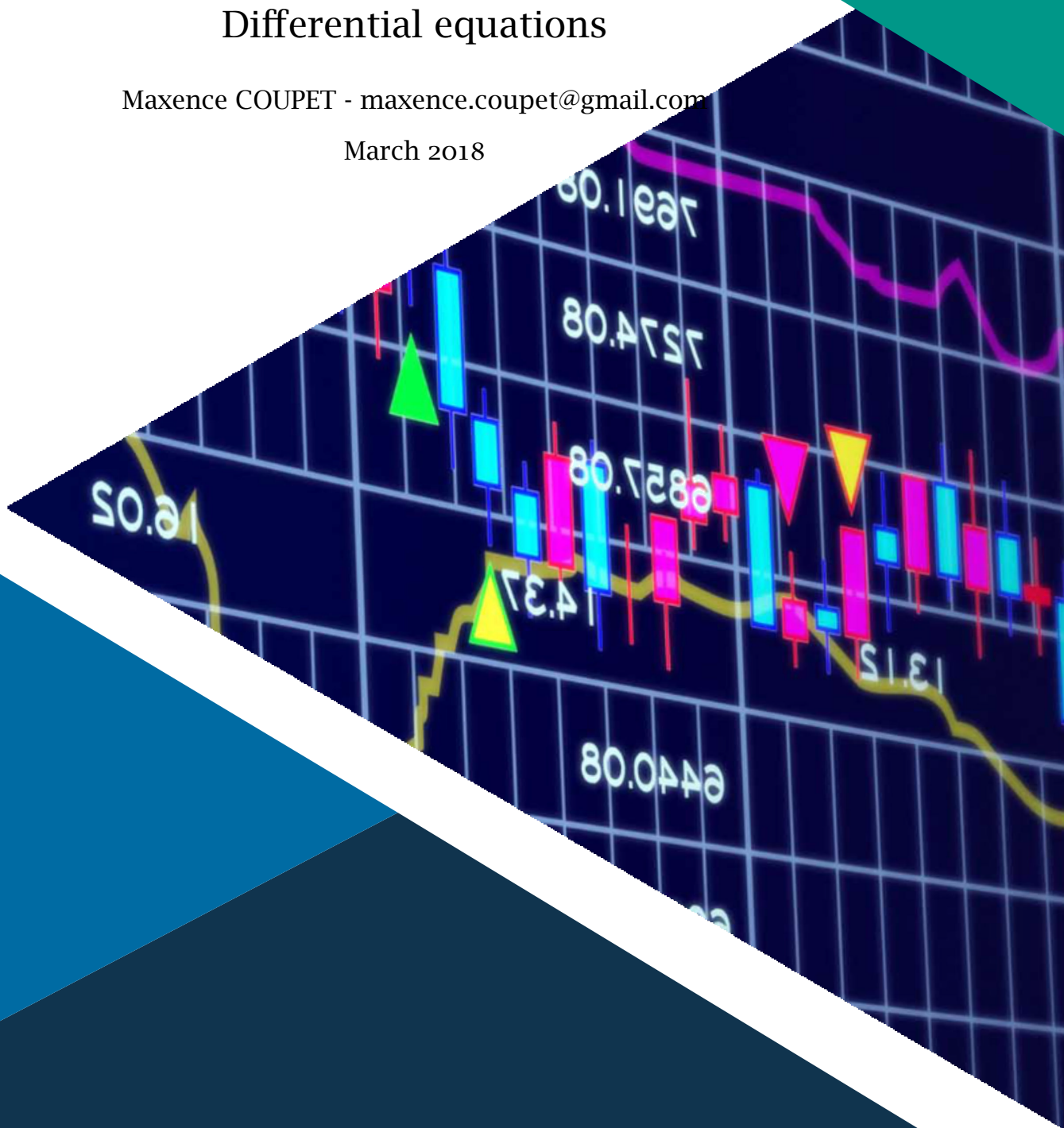


Differential equations

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1 Definitions

Definition 1.1. Differential equation

A n order **differential equation** is an equation defined by :

$$(E) : F(x, y, y', \dots, y^{(n)}) = 0$$

where F is a function of $(n+2)$ variables.

A **solution** for such an equation on an interval $I \subset \mathbb{R}$ is a function $y : I \rightarrow \mathbb{R}$ which is derivable n times and verify equation (E) .

Definition 1.2. Linear differential equation

A n order **linear** differential equation is an equation defined by :

$$(E) : a_0(x)y + a_1(x)y' + \dots + a_n(x)y^{(n)} = g(x)$$

The term linear refers to the fact that there is no nonlinear function applied to the y, y', \dots

Definition 1.3. Homogeneous differential equation

A n order homogeneous differential equation is an equation defined by :

$$(E_0) : a_0(x)y + a_1(x)y' + \dots + a_n(x)y^{(n)} = 0$$

Definition 1.4. Superposition principle

For a linear differential equation (E) , let S_h be the set of solutions for the homogeneous equation and y_0 a specific solution of (E) . Then, the set of solutions S is composed of :

$$y_0 + y \quad \text{with} \quad y \in S_h$$

2 Linear first order differential equation

2.1 Homogeneous first order differential equation

Definition 2.1.