

# Section 6.1

Math 231

Hope College

# Ordinary Differential Equations

- A **differential equation** (DE) is an equation involving an unknown function  $y(x)$ , its derivatives, and the independent variable  $x$ .
- The **order** of a DE is the highest derivative occurring in the equation.
- A DE is **autonomous** if the independent variable does not occur explicitly in the equation.
- A DE is **linear** if  $y$  and its derivatives appear only linearly. Higher powers of  $y$  and its derivatives, or products of two or more derivatives of  $y$ , are not allowed in linear DEs. (Note: There is no restriction on the functions of  $x$  appearing.)

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# Solutions of DEs

- A **solution** to a DE is a function  $y(x)$  that satisfies the relationship.
- DEs will generally have families of solutions depending upon one or more parameters.
- Extra pieces of information given with a DE in order to help you solve for the parameters are called **initial conditions** and turn the DE into an **initial value problem** (IVP).
- The set of all solutions to a DE (involving the parameters) is called the **general solution**. The solution to an IVP (in which the parameters are determined) is called a **particular solution**.

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