

# Goal and idea - Module 9

## **GOAL:**

Our goal is to understand the nature of solutions. And in particular, to find some "basic" or "core" solutions which generate *all* other solutions. To do so we:

- Discuss the 'linear' properties of solutions;
- Define the "fundamental set of solutions" as well as what it means for solutions to be linearly independent;
- Define the Wronskian of functions;
- Develop way to use the Wronskian to determine if solutions for a differential equation are linearly independent; and
- Learn how to determine if a given set of functions is a fundamental set of solutions for a differential equation.

## **IDEA:**

It ends up we can add any solutions together and again get a solution. We can also multiply a solution by any constant and get another solution. These are the critical properties of what is known as a vector space (if you've taken linear algebra!). Thus, we want to find a "basis" of this space. Finding such a "fundamental" set of solutions requires discussing the linear independence of functions, and for this we introduce and employ the Wronskian.