

Mathematical Modeling

The process of mathematical modeling requires three main steps, and these are used across all fields that need to use differential equations for this purpose.

Make the Model

- Comes from science principles
- Accumulation Equation works too.

Solve the ODE

- Get to a description of how the physical system will behave over time.
- Interpret solution in terms of the physical system.

Refine the Model / Testing against Data

- Make sure the model matches reality
- Expand to other² uses once it works.

Why is modeling useful?

Using mathematical models can be very useful in science and engineering fields for several reasons.

Optimal System Design

- Want the system to perform "as well as possible"
- Can do the tinkering and analysis on the differential equation instead of the physical object.

Fewer physical Experiments

- Could just run tests on the physical system
- Costs Time, Money, Materials
- Only need to physically test the final version.