Math 370

Section 2.1: Mathematical Models

The Modeling Process

1. Through observation, identify the primary factors involved in the real-world behavior, making simplifications when needed.
2. Conjecture tentative relationships among the factors.
3. Apply mathematical analysis to the resultant model.
4. Interpret mathematical conclusions in terms of the real-world problem.

Construction of Models

1. Identify the problem.
2. Make assumptions.
    a. Identify and classify the variables.
    b. Determine interrelationships among the variables.
3. Solve or interpret the model.
4. Verify the model.
    a. Does it address the problem?
    b. Does it make common sense?
    c. Test it with real-world data.
5. Implement the model.
6. Maintain the model.

Model Simplification	Model Refinement
1. Restrict problem identification.	1. Expand the problem.
2. Neglect variables.	2. Consider additional variables.
3. Conglomerate effects of several variables.	3. Consider each variable in detail.
4. Set some variables to be constant.	4. Allow variation in the variables.
5. Assume simple (linear) relationships.	5. Consider nonlinear relationships.
6. Incorporate more assumptions.	6. Reduce the number of assumptions.

Def: A model is called robust if its conclusions do not depend on the precise satisfaction of assumptions. The model is fragile if its conclusions do depend on the precise satisfaction of some sort of conditions.