

**tentative menu**

September 3, 2003

## **1 modeling**

### **1.1 what is modeling?**

### **1.2 what is a model?**

#### **1.2.1 qualitative models**

#### **1.2.2 quantitative models**

1. reading an equation: coordinates, parameters, and degrees of freedom
2. dimensional analysis and "the pi theorem"

## **2 perturbation theory**

### **2.1 naive perturbation theory**

#### **2.1.1 taylor expansion**

#### **2.1.2 simple harmonic oscillator: small damping**

#### **2.1.3 simple harmonic oscillator: small mass**

### **2.2 singular perturbation theory in pdes**

#### **2.2.1 fluid dynamics: small viscosity**

with digressions into convection and chaos

2.2.2 quantum mechanics: small planck's constant

### 3 large numbers

3.1 counting

3.2 statistics

3.3 monte carlo esp w/finance + gambling

3.4 genetics

3.5 machine learning

### 4 optimization

4.1 evolution

4.2 algorithms + greedy algorithms

### 5 things I don't know where to put:

5.1 cryptography

5.2 string theory + cosmology