5.95 (Spring 2009)

Homework 1

*Due in class on **Tuesday, 10 Feb 2009.***

Reading

The readings mentioned below are linked from the 'readings' section of the website.

At the beginning of class on Tuesday (10 Feb), please turn in the index card mentioned below. The index card has two purposes: (1) to give a structure for reading before class; and (2) to show me what you find most interesting about the readings and their relation to teaching.

1. **Chunking**

   Read the famous paper on chunking by George Miller. As you read it, think about how this information can help one teach equations. On one side of an index card, write down one question that occurs to you about the paper or because of reading the paper.

   Please write your name on the card!

2. **Benezet**

   Read about Benezet's experiment in mathematics teaching (Parts I and III, with Part II optional). They are my favorite papers on teaching. On the other side of the index card, write down one question that occurs to you about the papers or because of reading the papers.

Equations

3. **How might you teach it?**

   Choose one of these equations and think about how you might teach it:

   a. Ideal-gas law:

   $$pV = nRT,$$

   where p is the pressure, V is the volume, n is the number of moles, R is the gas constant, and T is the temperature.

   b. Period of a simple pendulum (for small amplitudes):

   $$T = 2\pi\sqrt{\frac{l}{g}},$$

   where T is the period, l is the length of the string, and g is the gravitational acceleration.

   c. Stefan–Boltzmann law:

   $$F = \sigma T^4,$$

where F is energy flux, T is temperature, and σ is Stefan's constant.

d. Beam equation:

$$EI \frac{d^4 u}{dx^4} = w(x),$$

where E is the elastic modulus, I is the areal moment of inertia, x is the coordinate along the beam, u is the deflection, and $w(x)$ is the load.

e. Euler's famous sum:

$$\sum_1^\infty \frac{1}{n^2} = \frac{\pi^2}{6}.$$

f. Another famous Euler formula, this time for a solid object:

$$V - E + F = 2,$$

where V is the number of vertices, E is the number of edges, and F is the number of faces.

Nothing is required to be turned in for this problem; just think it through (collaboration encouraged!) and make notes for yourself.