1. The following statements are facts:

$$(10{,}000{,}000{,}000)^{\left(\frac{1}{10{,}000{,}000{,}000}\right)} \approx 1.\ 00000\ 000\underline{23}\ \underline{02585}\ \underline{09}564$$

and

$$\ln 10 \approx \underline{2.30258}\ \underline{509}29$$

Explain the amazing coincidence of the digits.

Hint Approximate e^x when x is small.

2. For any constant c, define the function f_c with the formula $f_c(x) = x^3 + 2x^2 + cx$.

a) Graph $y = f_c(x)$ for these values of the parameter c: $c = -1, 0, 1, 2, 3, 4$. What are the similarities and differences among the graphs, and how do the graphs change as the parameter increases?

b) For what values of the parameter c will f_c have one local maximum and one local minimum? Use calculus. As c increases, what happens to the distance between the local maximum and the local minimum?

c) For what values of the parameter c will f_c have no local maximum or local minimum? Use calculus.

d) Are there any values of the parameter c for which f_c will have exactly one horizontal tangent line?

3. In this problem, $f(x) = \frac{1}{1+x} - \cos x$.

a) Graph $f(x)$ in the window $0 \le x \le 6$ and $-1 \le y \le 1.5$.

b) Write an equation showing how x_n, an approximation for a root of $f(x) = 0$, is changed to an improved approximation, x_{n+1}, using Newton's method. Your equation should use the specific function in this problem.

c) Suppose $x_0 = 2$. Compute the next two approximations x_1 and x_2. Explain what happens to the sequence of approximations $\{x_n\}$ as n gets large. You should use both numerical and graphical evidence to support your assertion.

d) Suppose $x_0 = 4$. Compute the next two approximations x_1 and x_2. Explain what happens to the sequence of approximations $\{x_n\}$ as n gets large. You should use both numerical and graphical evidence to support your assertion.

One problem will be selected for a writeup to be handed in at the next recitation meeting. Please see Professor Greenfield's Math 151 webpage to learn which problem to hand in.