Deadlines
Wed May 5 17:00:00 GMT-8 2004

Learning Keywords
gcc, make, long, long double, printf, loops, floating point arithmetic, overflow.

Your Task
In this assignment you are required to implement a C program that calculates \( \pi \) using the formula:

\[
\pi = 2 \prod_{n=1}^{\infty} \frac{(2n)^2}{(2n-1)(2n+1)}
\]

\[
\pi = 2 \cdot \frac{2 \cdot 2}{1 \cdot 3} \cdot \frac{4 \cdot 4}{3 \cdot 5} \cdot \frac{6 \cdot 6}{5 \cdot 7} \cdots
\]

The formula above computes the value of \( \pi \) as a product of infinite number of terms. Each additional term increases the accuracy of the computed value. Your program should

- Approximate \( \pi \) by multiplying 1,000,000,000 terms using a loop.
- Print out the value computed so far up to 50 decimal places after every 100 iterations.
- Use type unsigned long for variable \( n \) above in your program to avoid overflows, and use a variable of type long double to store the computed value of \( \pi \).

Submission Requirement
Make sure you have read the submission instruction document posted on CS2281 website. For this assignment, create a subdirectory under $HOME/CS2281LABs/ called a1 and put all your submissions under the subdirectory. You are required to submit the C program which must be named pi.c and the Makefile you used to compile pi.c. Include your name as a comment in the first line of the file. I will access your homework using pathname $HOME/CS2281LABs/a1/pi.c.pgp and $HOME/CS2281LABs/a1/Makefile.pgp. It is your responsibility to make sure that the filenames are correct and permissions are set properly according to the instructions given.

Additional Tips
- Make sure when you compute the term \( \frac{(2n)^2}{(2n+1)(2n-1)} \) operator, it is performing floating point arithmetic instead of integer arithmetic. You should be careful so that the intermediate results do not overflow as well.
- Check man page for printf or google to find out how to print a long double.