Mathematics 446 — fifth assignment — due Monday, November 10

Exercise 1. *Write out in detail the proofs of Archimedes' axioms for curve length for polygonal paths.*

Exercise 2. *Write out completely the proof of V.16 from Euclid, including details of all relevant earlier results in Book V, and being careful how you apply the definitions. Use your own words and symbols.*

Exercise 3. *Suppose given a series of numbers X_n such that $X_n = cX_{n-1} + dX_{n-2}$. Show that there exist numbers a and b such that $X_n = a\alpha^n + b\beta^n$ where α and β are the roots of*

$$x^2 = cx + d \ .$$

Explain how to determine a and b explicitly.

Exercise 4. *Read Propositions 18–24 of Archimedes' 'Quadrature of the parabola'. Rewrite the whole argument clearly in your own words. Include lots of pictures.*

Exercise 5. *(a) Write down the explicit formula for the length of a regular polygon of $2n$ sides, given that for n sides. (b) Give an estimate as accurate as you can of how many subdivisions of the square you would have to make to calculate the area of a circle, hence π, correctly to 10 decimals. You will want to use the previous exercise on parabolas. Explain.*