Math 1118: Second Project
Due: Monday, December 3rd

In this project we will think about problems related to regular convex polyhedra.

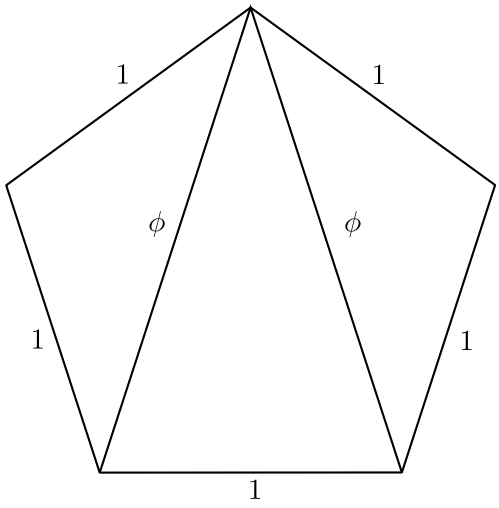
Construction

1 (15 pts) Construct each of the 5 regular convex polyhedra.

- An edge of your tetrahedron should be 5 inches in length.
- An edge of your octahedron should be 4 inches in length.
- An edge of your cube should be 4 inches in length.
- An edge of your dodecahedron should be 2 inches in length.
- An edge of your icosahedron should be 3 inches in length.

2 (5 bonus pts) For pizazz in the construction/design of each of the solids above—this will be a **difficult** point to earn.

3 (5 pts) Compute the surface area of the dodecahedron you constructed. Explain your reasoning. Big hint, for the dodecahedron, consider this diagram of the regular pentagon



where $\phi = \frac{1+\sqrt{5}}{2}$. Have you seen this number before?

Viewpoints

In this series of questions, we will suppose in turn that you live on a planet that is shaped like each of the regular convex polyhedra—not unlike *Le Petit Prince* who lives on an asteroid.

4 (15 pts) Considering each of the five regular convex polyhedra in turn, construct a table like the one

	tetrahedron	octahedron	cube	dodecahedron	icosahedron
middle face					
middle edge					
vertex					

that shows what fraction of the planet's surface could you see if you stood:

(1) In the middle of a face?

(2) In the middle of an edge?

(3) On a vertex?

In each case, explain your reasoning.

5 (5 pts) Now suppose that you lived on a tetrahedron. If you wished to go on a walk, surveying your polyhedral planet, give the shortest path you can (draw it on a net) that would allow you to observe the entire tetrahedron-planet. Explain your reasoning.

Grading Rubric

This assignment is worth 40 points with points assigned as described above.