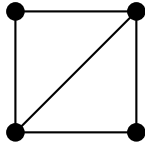
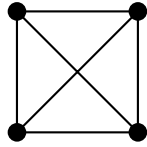


We say a graph is *planar* if it is possible to draw it (on a plane) without any edges crossing (except at vertices).

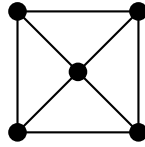
1. Which of the graphs below are planar? You might need to redraw some.



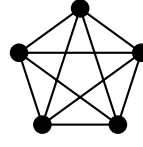
A



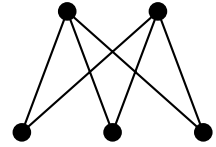
B



C



D



E

2. When a graph is planar *and* drawn in a planar way (without edges crossing), it divides the plane into regions we call *faces*. For each planar graph above, how many faces are there? Be sure to count the *outside* region as a face as well.
3. Draw three *different* planar graphs, each having 4 faces. Try to have a different number of vertices or edges for each graph (record these numbers).

4. Draw three *different* planar graphs, each having 5 vertices. Try to have a different number of edges or faces for each graph (record these numbers).

5. Draw three *different* planar graphs, each having 6 edges. Try to have a different number of faces or vertices for each graph (record these numbers).

6. What is the relationship between the number vertices, edges and faces for planar graphs? Use  $V$ ,  $E$ , and  $F$  to represent these numbers - find an equation relating them.