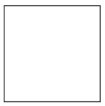
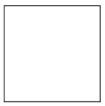
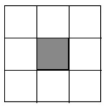
1. *The Sierpinski Carpet*

   (a) Using graph paper, carefully draw the figures that result from (at least) the first three steps, with the following recursive replacement rule:

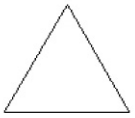
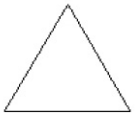
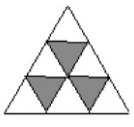
   Start with a square  *. Whenever (and wherever) you see a*  *, replace it with a*  *.*

   Suggestion: Since you're going to be dividing the sides of your squares into thirds three times, you might want to start with them having length 27, if the squares on your graph paper are small enough.

   Note: As with the version of the Sierpinski triangle we created in class, this is actually the negative version of the actual Sierpinski carpet. For the true Sierpinski carpet, you start with a full colored-in square, and remove the middle ninth at each step, leaving that portion empty.

   (b) Find the similarity dimension of the Sierpinski carpet. **Note: When finding the similarity dimension, remember the true Sierpinski carpet is filled in where yours is empty, and is empty where yours is filled in.**

2. *The Mitsubishi Gasket* Using graph paper, carefully draw the figures that result after (at least) two steps, with the following recursive replacement rule:

   Start with an equilateral triangle  *. Whenever (and wherever) you see a*  *, replace it with a*  *.*

Suggestion: Since you're going to be dividing the side of your triangles into thirds twice, you want to start with them having a length that's a multiply of 9.

Note: This is again the negative version. For the true version, you would again begin with a solid triangle and remove portions at each step.

3. *Tree:* Using graph paper, carefully draw the figure that results after (at least) five steps, with the following recursive replacement rule:

   Start with a line segment with a solid circle on one end and an open circle on the other end.  *. Whenever (and wherever) you see a*  *, replace it with a line segment of the same length, with solid circles on both ends, but with two line segments (roughly) half as long coming out of where the open circle was, each at an angle of* 45° *with the original line segment (if it had continued), so that they're* 90° *apart from each other. These have an open circle on the end.*  .

   (The solid and open circles are signals as to which ends are finished and which ends are going to grow. An endpoint that is solid is done growing – any endpoint that is open is still ripe for growth.)

   Suggestion: Since you're going to be dividing the length of your line segment in half at least 5 times, you probably want to start with a line segment that's 16 units long (32 would be even better, but you're not going to have room for that).

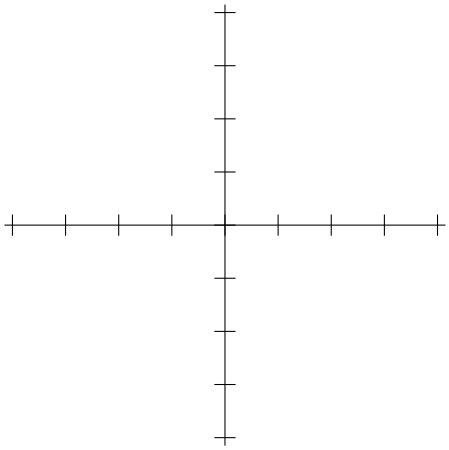
4. What points in the plane do the following complex numbers represent? Graph (and label) each one on the set of axes provided.

   (a) $2 - 3i$

   (b) $3 + 4i$

   (c) 7

   (d) $-2i$



5. Evaluate the following: (Remember that $i = \sqrt{-1}$.)

   (a) $(-7 + i) - (1 + 6i)$

   (b) $(3 - i)(5 + 2i)$

   (c) $i(4 + 3i)$

   (d) $(-2 + 4i)(8 - i)$