

1. Here is a list of infinite sets, coupled with an operation. For each, say “yes” or “no” to whether or not it is a group.

a) integers under addition \_\_\_\_\_

b) odd integers under addition \_\_\_\_\_

c) real numbers under multiplication \_\_\_\_\_

d) integer powers of 5 under multiplication \_\_\_\_\_

e) rotation by an integer number of degrees \_\_\_\_\_

f) complex numbers under addition \_\_\_\_\_

2. Which two groups from #1 (refer to them by letter) are isomorphic to one another? \_\_\_\_\_ and \_\_\_\_\_.

3. Give a set of elements that forms a group under multiplication, that is isomorphic to the rotation group of a pentagon.

4. The complex number  $z = \frac{(-4+4i)^5}{(\sqrt{3}-i)^{12}}$  can be simplified to  $a + bi$  form where  $a$  and  $b$  are integers. Find  $a$  and  $b$ .

$a =$  \_\_\_\_\_  $b =$  \_\_\_\_\_



5. On the coordinate axis on the right...

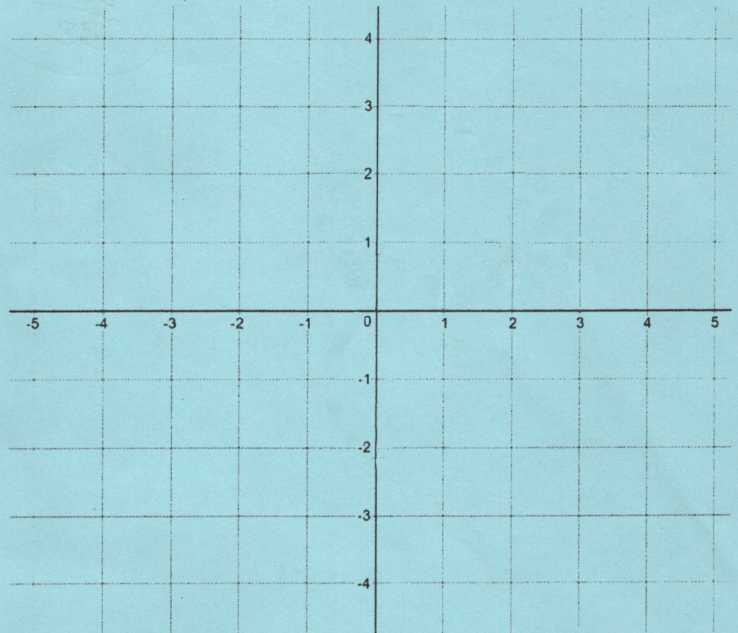
- a) Plot the set of all complex numbers  $z$  in the first quadrant where  $|z|=1$ . Label this set as "A".

Use these numbers to obtain your answers for parts (b)-(d) below.

- b) Plot the set of all complex numbers  $3z$ . Label this set as "B".

- c) Plot the set of all complex numbers  $(z - 1)$ . Label this set as "C".

- d) Plot the set of all complex numbers  $(z - 1)^2$ . Label this set as "D".



6. The matrix multiplication below shows a transformation matrix's effect quadrilateral ABCD.

$$\begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 1 & 1 & 2 & 2 \\ 0 & -1 & 0 & 2 \end{bmatrix}$$

- a) On the grid to the right, graph the quadrilateral ABCD and label its vertices A, B, C, and D.

- b) Perform the indicated transformation and label the resulting image, with vertices A', B', C', and D'.

- c) Describe the effect of the transformation matrix (use specific math vocabulary).

