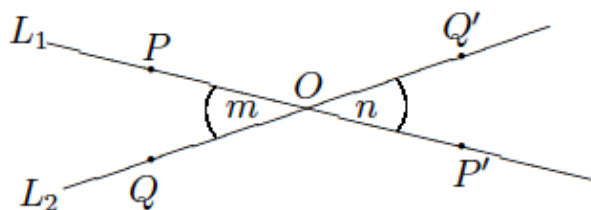


## Lesson 6: Rotations of 180 Degrees

### Classwork

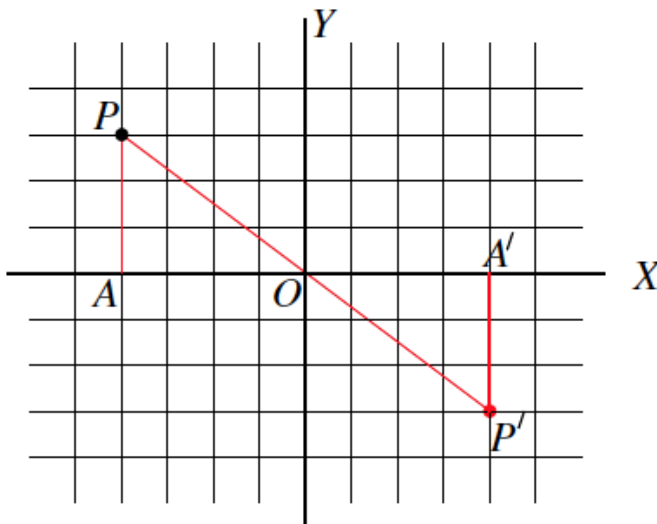
#### Example 1

The picture below shows what happens when there is a rotation of  $180^\circ$  around center  $O$ .



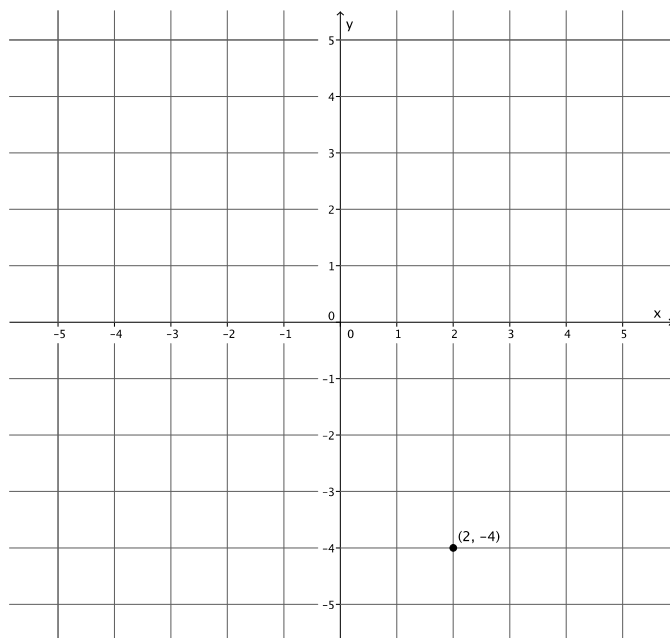
#### Example 2

The picture below shows what happens when there is a rotation of  $180^\circ$  around center  $O$ , the origin of the coordinate plane.

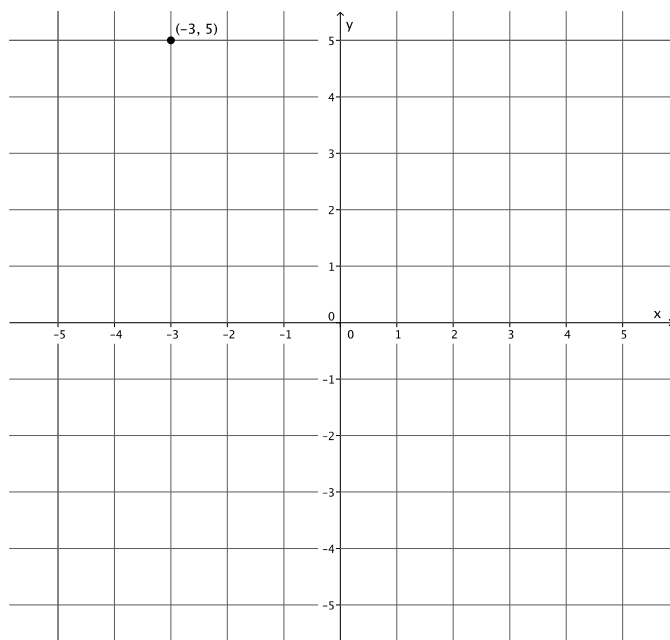


## Exercises 1–9

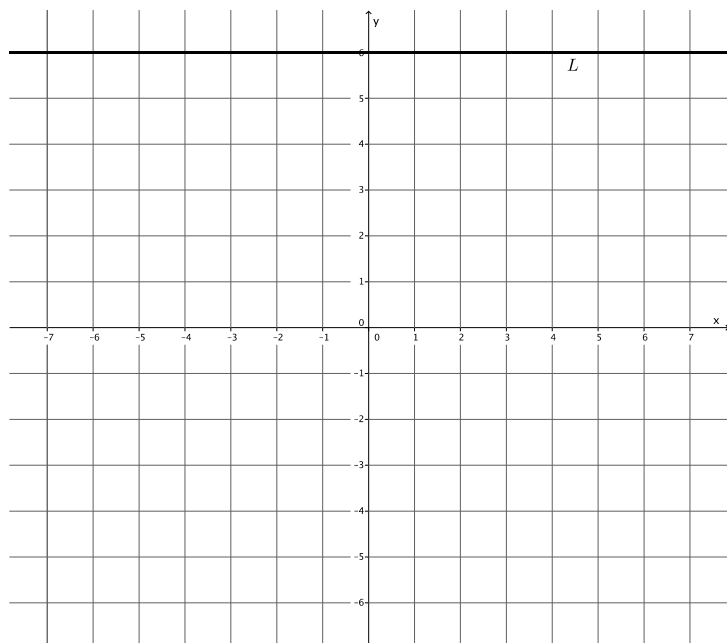
1. Using your transparency, rotate the plane 180 degrees, about the origin. Let this rotation be  $Rotation_0$ . What are the coordinates of  $Rotation_0(2, -4)$ ?



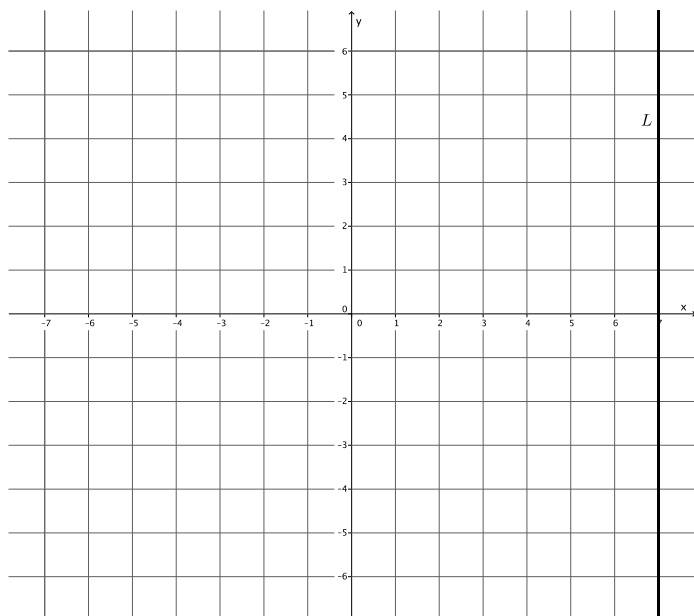
2. Let  $Rotation_0$  be the rotation of the plane by 180 degrees, about the origin. Without using your transparency, find  $Rotation_0(-3, 5)$ .



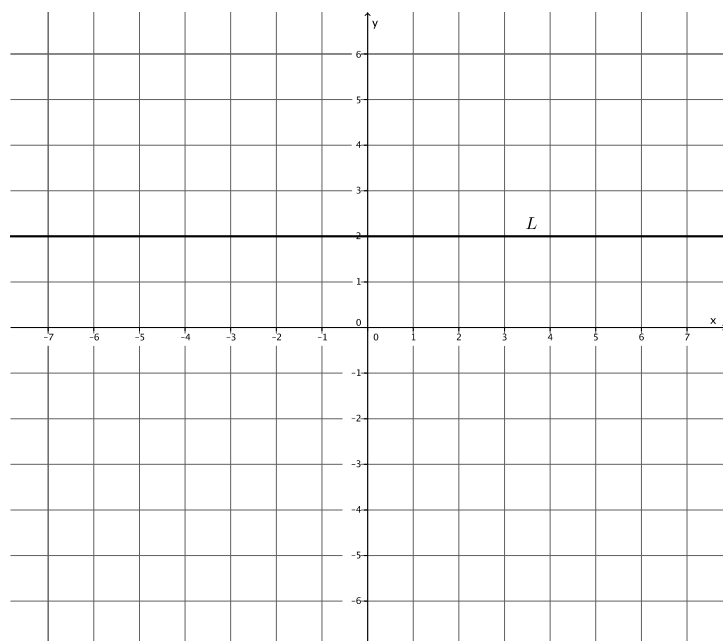
3. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Let  $L$  be the line passing through  $(-6,6)$  parallel to the  $x$ -axis. Find  $Rotation_0(L)$ . Use your transparency if needed.



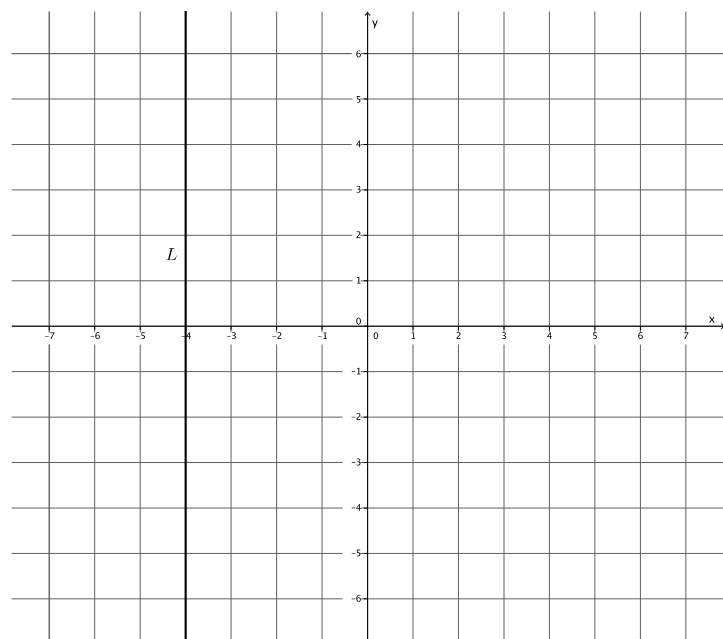
4. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Let  $L$  be the line passing through  $(7,0)$  parallel to the  $y$ -axis. Find  $Rotation_0(L)$ . Use your transparency if needed.



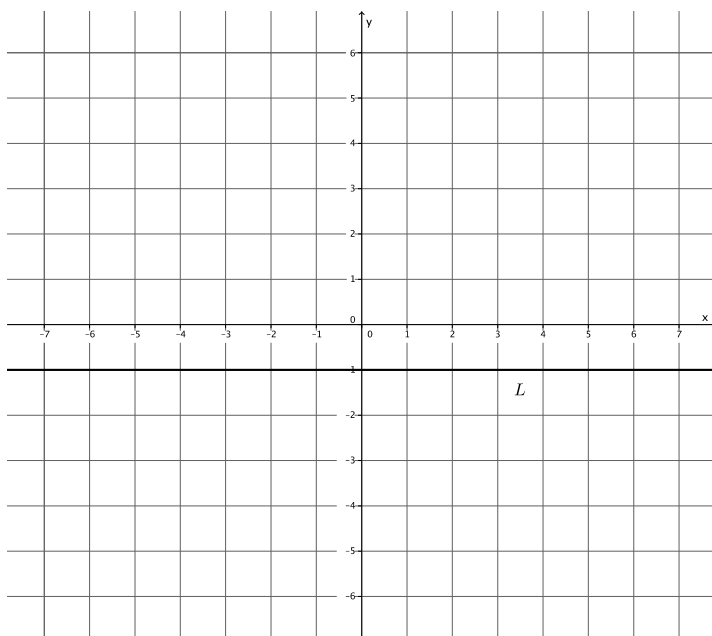
5. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Let  $L$  be the line passing through  $(0,2)$  parallel to the  $x$ -axis. Is  $L$  parallel to  $Rotation_0(L)$ ?



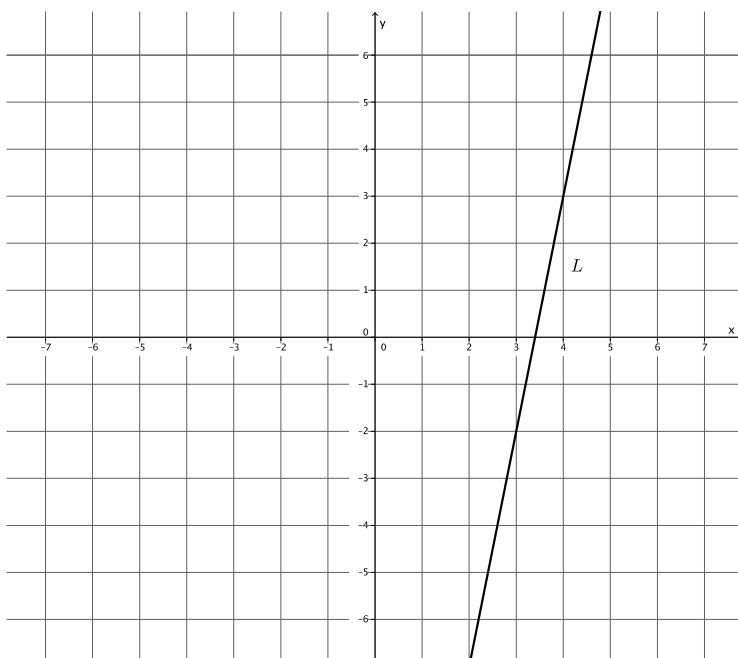
6. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Let  $L$  be the line passing through  $(4,0)$  parallel to the  $y$ -axis. Is  $L$  parallel to  $Rotation_0(L)$ ?



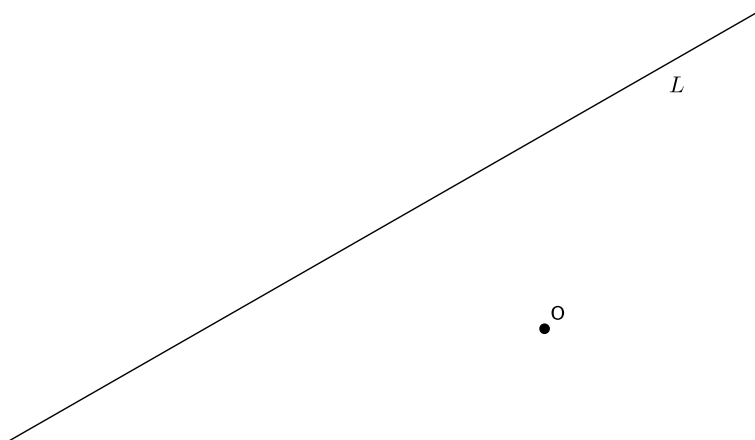
7. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Let  $L$  be the line passing through  $(0, -1)$  parallel to the  $x$ -axis. Is  $L$  parallel to  $Rotation_0(L)$ ?



8. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Is  $L$  parallel to  $Rotation_0(L)$ ? Use your transparency if needed.



9. Let  $Rotation_0$  be the rotation of 180 degrees around the origin. Is  $L$  parallel to  $Rotation_0(L)$ ? Use your transparency if needed.



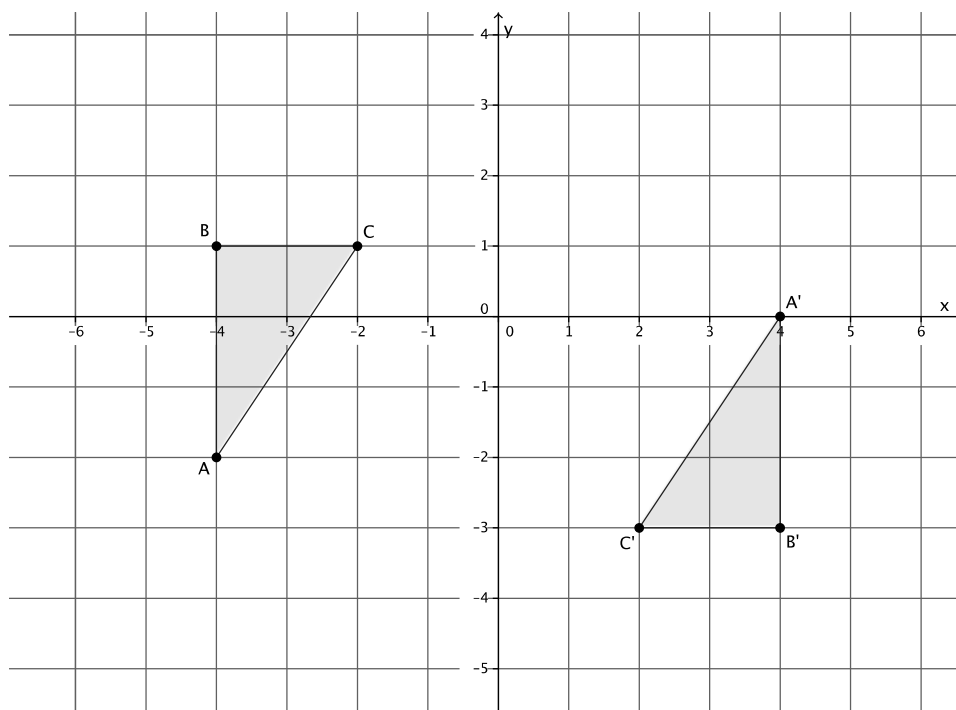
## Lesson Summary

- A rotation of 180 degrees around  $O$  is the rigid motion so that if  $P$  is any point in the plane,  $P$ ,  $O$ , and  $Rotation(P)$  are *collinear* (i.e., lie on the same line).
- Given a 180-degree rotation,  $R_O$  around the origin  $O$  of a coordinate system, and a point  $P$  with coordinates  $(a, b)$ , it is generally said that  $R_O(P)$  is the point with coordinates  $(-a, -b)$ .

Theorem: Let  $O$  be a point not lying on a given line  $L$ . Then, the 180-degree rotation around  $O$  maps  $L$  to a line parallel to  $L$ .

## Problem Set

Use the following diagram for Problems 1–5. Use your transparency as needed.



1. Looking only at segment  $BC$ , is it possible that a  $180^\circ$  rotation would map  $BC$  onto  $B'C'$ ? Why or why not?
2. Looking only at segment  $AB$ , is it possible that a  $180^\circ$  rotation would map  $AB$  onto  $A'B'$ ? Why or why not?
3. Looking only at segment  $AC$ , is it possible that a  $180^\circ$  rotation would map  $AC$  onto  $A'C'$ ? Why or why not?

4. Connect point  $B$  to point  $B'$ , point  $C$  to point  $C'$ , and point  $A$  to point  $A'$ . What do you notice? What do you think that point is?
5. Would a rotation map triangle  $ABC$  onto triangle  $A'B'C'$ ? If so, define the rotation (i.e., degree and center). If not, explain why not.
6. The picture below shows right triangles  $ABC$  and  $A'B'C'$ , where the right angles are at  $B$  and  $B'$ . Given that  $AB = A'B' = 1$ , and  $BC = B'C' = 2$ , and that  $AB$  is not parallel to  $A'B'$ , is there a  $180^\circ$  rotation that would map  $\triangle ABC$  onto  $\triangle A'B'C'$ ? Explain.

