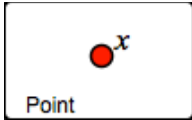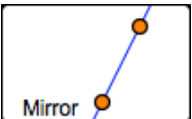# Reflection Challenges   Name(s):
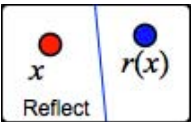
REFLECT A POINT

1. Open geometricfunctions.org/links/reflection-family/. Go to page 2.

2. In the toolbox, tap | Point |. Then tap in the sketch, and x is placed!

3. Drag variable x around the screen.

4. Tap | Mirror |. Tap or drag both glowing points.

5. Tap | Reflect |. Attach the glowing x to the original x. The dependent variable is the *reflection* across line j of x. It's called $r_j(x)$ for short.

Q1 Make mirror j vertical, and then drag variable x up. Which way does $r_j(x)$ go? Draw a sketch to show what happened.

Drag independent variable x left. Which way does the dependent variable $r_j(x)$ go? Draw a sketch to show what happened.

Q2 Trace an interesting shape and describe it. How are the blue $r_j(x)$ traces similar to the red x traces, and how are they different? Include a drawing showing your shapes.
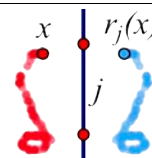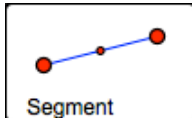
Q3 Erase the tracing and do a new one. What happens when you drag x across the mirror? Describe the traced shapes, and include a drawing on your paper.
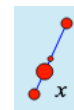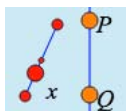
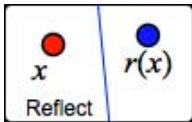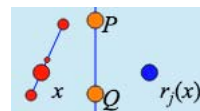## MATCH THE TRACES

6. On page 3, contruct a segment. Segment

7. Construct x attached to the segment, **but not on the end points or midpoint.** Drag x to make sure it's attached.
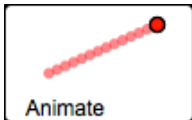
8. Construct a vertical mirror.

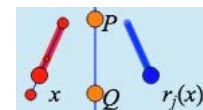9. Tap | x Reflect $r(x)$ |. Attach the glowing x to the original x.

10. Tap | Animate | and attach the glowing x to the original x.

11. Notice the Animate x button. Tap it. Then turn tracing on. The red traces show the *domain*. The blue traces show the *range*.
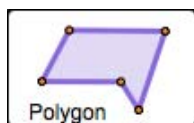
Q4 Move the mirror and the segment, and use tracing to match the pictures below. In each box, draw a line to show where you put the mirror. Try to match all 5!
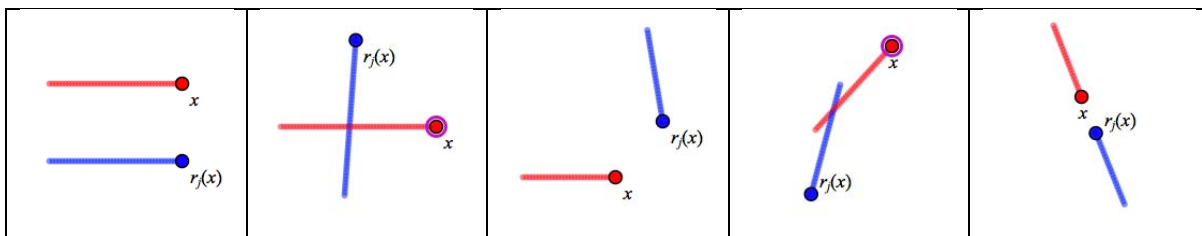
Q5 Describe the method(s) you used to place the mirrors. Did you develop new tricks as you did the five challenges?

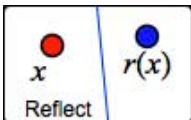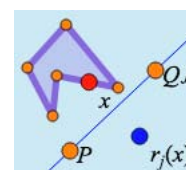## RESTRICT THE INDEPENDENT VARIABLE TO A POLYGON

12. On page 4, tap [Polygon] to make a polygon. Tap to place each glowing point.

13. Construct independent variable x on the polygon. Drag x to make sure it's attached. (The polygon is now the domain.)

14. Construct a mirror. Then tap [Reflect] and attach the glowing x to the original x.

15. Turn on tracing and drag or animate x. Adjust the polygon to make an interesting shape.

Q6 Adjust your mirror so you can get x and $r_j(x)$ in the same place at the same time. A place like this is called a *fixed point* of the function. Adjust your polygon and mirror so there are two fixed points. Erase your traces and then animate. Draw a sketch below to show what you did.

Q7 Adjust the domain (the polygon) so that on one side of the polygon the variables move in the same direction, and on another side they move in opposite directions. Draw a sketch to show how you did it.

REFLECTION CHALLENGES

Q8 On page 5, figure out where the mirror is that is reflecting the domain and range. How can you check your guess to be sure? Draw your solution below.

Q9 On pages 6 and 7, there are two more find-the-hidden-mirror challenges. Solve them, and describe your methods. Draw a sketch for each solution. Which challenge was harder? Why?

Q10 On page 8, find the mirror that reflects independent variable x to dependent variable $f(x)$. Draw your solution below.