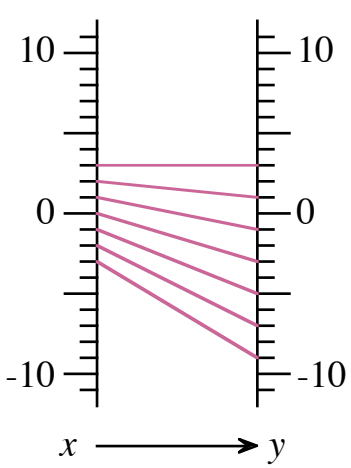
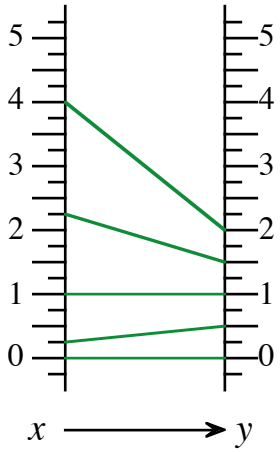


Magnification





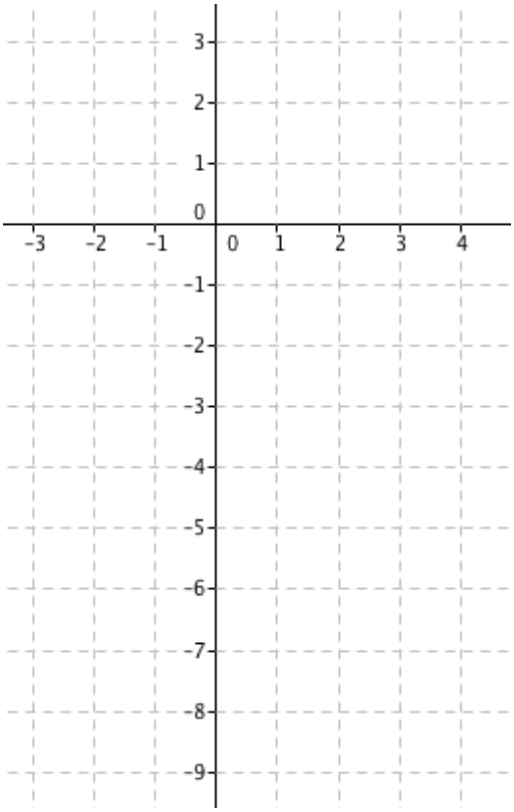
Any interval in the domain is "magnified" by a continuous function into an interval in the range. The *magnification* is the factor by which we multiply the directed length of the x interval to get the directed length of the corresponding y interval.

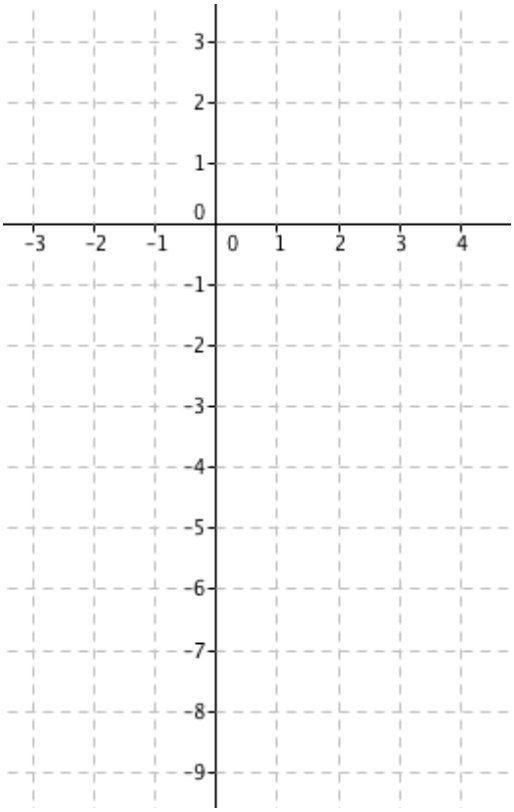
1. Find the magnifications for several intervals as illustrated by the diagrams above.

2. Show that the magnification is constant for all the intervals in the domain of the first diagram, but not so for the intervals in the domain of the second.

3. Using a ruler, extend the first diagram's input-output lines towards the left. If you do it accurately, they will all meet in one point, called *the focus*. Use geometry to explain why.

4. Make a Cartesian graph for the above functions, connecting the points in a smooth curve for each one. Comment.

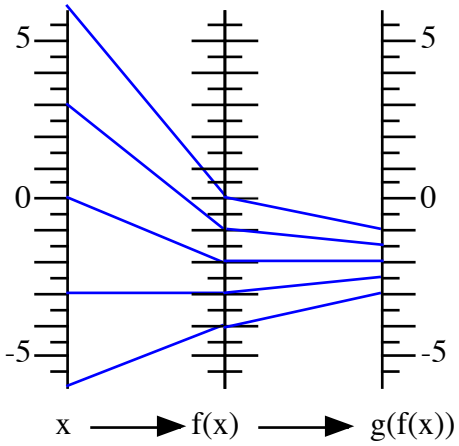




Composing Functions

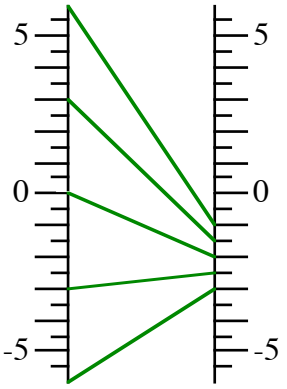
$$f(x) = \frac{x}{3} - 2$$

$$g(x) = \frac{x}{2} - 1$$



x ⟶ f(x) ⟶ g(f(x))

The Composite Function



x ⟶ g(f(x))

5. How was the function diagram of the composite function obtained from the linked diagrams?

6. What formula corresponds to it? How could this formula be obtained from the original two?

7. How is the magnification of the composite function related to the magnifications of the original functions? Is this a coincidence? Explain.

8. How is this related to a concept in calculus?

9. What would the function g have to be instead if we want the composite function to be the identity function y=x? What would you call g in that situation?

10. If g(f(x))=x for all x, how would the diagram of g be related to the diagram of f? Explain.