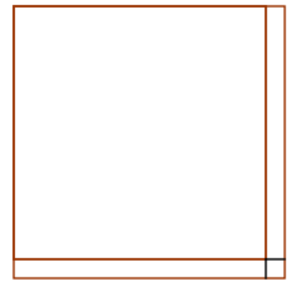
Geometry of Another Derivative

Over the weekend you actively watched a video setting up a way to use the geometry of an x by $\frac{1}{x}$ rectangle to find $\frac{dy}{dx}$ when $y = \frac{1}{x}$. You completed the process and wrote an explanation.



1. Now consider $f(x) = \sqrt{x}$. Your task is to make a similar geometric argument for $\frac{dy}{dx}$ when $y = \sqrt{x}$.

   (a) Draw a square. We'll assume that the area of the square is x. Label the lengths of the base and right adjacent side.

   (b) Using the figure above as an initial guide, enlarge the square. and compute the size of each of the three new pieces of the larger square.

   (c) Demonstrate how to use the diagram to find $\frac{dy}{dx}$ when $y = \sqrt{x}$.

Chain Rule Practice

2. Assume that $f(x)$ and $g(x)$ are differentiable functions about which we know very little. In fact, assume that all we know about these functions is the following table of data:

   - Let $m(x) = \frac{1}{(f(x))^3}$. What is $m'(1)$?

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
-2	3	1	-5	8
-1	-9	7	4	1
0	5	9	9	-3
1	3	-3	2	6
2	-5	3	8	?

3. Demonstrate how to find $\frac{dy}{dx}$ when:
   (Note: Be sure to use equations. Expressions need not be "simplified.")

   (a) $y = (3x^5 - 4)^{10}$

   (b) $y = e^{-x^2}$

   (c) $y = \cos\left(\frac{1}{x}\right)$

   (d) $y = x \cdot \sin(x^6)$