DoNow

1. Use a difference quotient to find $g'(a)$ when:

   (i) $g(x) = \sqrt{x}$ (ii) $g(x) = \dfrac{1}{x^2}$

More Derivative Rules

2. Let $g(x)$ be a differentiable function and let $f(x) = \dfrac{1}{g(x)}$. Use a difference quotient to develop a shortcut (call it the *reciprocal rule*) for finding $f'(x)$ when you already know $g'(x)$.
   - Test your reciprocal rule when $f(x) = \dfrac{1}{x^2}$.

3. Use the reciprocal rule and the product rule to develop a *quotient rule* for $q'(x)$ when $q(x) = \dfrac{f(x)}{g(x)}$ and $f'(x)$ and $g'(x)$ are known.
   - Test your quotient rule when $q(x) = \dfrac{x^4}{x^2}$.

4. Now another approach: Use just the *product rule* to develop the *quotient rule.*

   Hints: This time consider $f(x) = \dfrac{u(x)}{v(x)}$. Since functions are our friends, we can be informal call them by their first names. Consider $f = \dfrac{u}{v}$, where we can write $f'(x)$ as f' … .

Practice

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:

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	?

This isn't a lot of information. For example, we can't compute $f'(3)$ with any degree of accuracy. But we are still able to figure some things out, using the rules of differentiation.

1. Let $h(x) = e^x f(x)$. What is $h'(0)$?
2. Let $j(x) = -4f(x)g(x)$. What is $j'(1)$?
3. Let $k(x) = \dfrac{xf(x)}{g(x)}$. What is $k'(-2)$?
4. Let $l(x) = x^3 g(x)$. If $l'(2) = -48$, what is $g'(2)$?
5. Let $n(x) = x^2 f(x)g(x)$. What is $n'(1)$?