

Using the four step process find $f'(1)$, $f'(2)$, $f'(3)$

$$f(x) = \frac{6}{x} - 2$$

Step 1. $f(x+h) = \frac{6}{x+h} - 2$

Step 2. $f(x+h) - f(x) = \left(\frac{6}{x+h} - 2 \right) - \left(\frac{6}{x} - 2 \right)$
 $= \frac{6}{x+h} - \frac{6}{x} = \frac{6x - 6x - 6h}{x(x+h)} = \frac{-6h}{x(x+h)}$

Step 3. $\frac{f(x+h) - f(x)}{h} = \frac{\frac{-6h}{x(x+h)}}{h} = -\frac{6}{x(x+h)}$

Step 4. $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{-6}{x(x+h)} = -\frac{6}{x^2}$

$$f'(1) = -\frac{6}{1^2}, \quad f'(2) = -\frac{6}{4} = -\frac{3}{2}, \quad f'(3) = -\frac{6}{9} = -\frac{2}{3}$$

$-\frac{6}{1^2}$

$-\frac{6}{2^2}$

$-\frac{6}{3^2}$