
1 (10 pts). Compute the difference quotient

$$\frac{g(x+h) - g(x)}{h}$$

for $g(x) = \frac{1}{3x-2}$ and cancel the factor h from the bottom and top.

Solution:

1.(Source: 2.10.more.1k)

$$\begin{aligned}\frac{g(x+h) - g(x)}{h} &= \frac{\frac{1}{3(x+h)-2} - \frac{1}{3x-2}}{h} \\&= \left(\frac{3x-2}{3x-2} \cdot \frac{1}{3x+3h-2} - \frac{1}{3x-2} \cdot \frac{3x+3h-2}{3x+3h-2} \right) \frac{1}{h} \\&= \left(\frac{3x-2 - (3x+3h-2)}{(3x-2)(3x+3h-2)} \right) \frac{1}{h} \\&= \frac{-3h}{(3x-2)(3x+3h-2)h} \\&= \frac{-3}{(3x-2)(3x+3h-2)}\end{aligned}$$