

Another example of finding difference quotient.

Find the Difference Quotient given

$$f(x) = \frac{3}{x+1}$$

The Difference Quotient

$$\frac{f(x+h) - f(x)}{h} = \frac{\frac{3}{(x+h)+1} - \frac{3}{x+1}}{h}$$

$$= \frac{\frac{3}{x+h+1} - \frac{3}{x+1}}{h}$$

Now get a common  
denom & subtract

$$= \frac{\frac{3}{(x+h+1)} \left( \frac{x+1}{x+1} \right) - \frac{3}{(x+1)} \left( \frac{x+h+1}{x+h+1} \right)}{h}$$

$$= \frac{3(x+1) - 3(x+h+1)}{(x+h+1)(x+1)h}$$

parentheses  
important!

$$= \frac{\cancel{3x} + \cancel{3} - \cancel{3x} - 3h - \cancel{3}}{(x+h+1)(x+1)} \cdot \frac{1}{h}$$

← instead of dividing by  $\frac{1}{h}$ , mult. by  $\frac{1}{h}$

$$= \frac{-3h}{(x+h+1)(x+1) \cdot h}$$

$$= \boxed{\frac{-3}{(x+h+1)(x+1)}}$$

Don't worry about "wasting" paper.  
Write big & show steps!! 😊