**quiz 10**
math1117.07
u new haven
*wed, 16 oct*

name: Solution

**1** (10 points). Use limits to find the derivative to the function

$$f(x) = \frac{x}{x+2}$$

and evaluate $f'(-1)$.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{\frac{x+h}{x+h+2} - \frac{x}{x+2}}{h}$$

$$= \lim_{h\to 0} \frac{\frac{x+2}{x+2}\left(\frac{x+h}{x+h+2}\right) - \left(\frac{x+h+2}{x+h+2}\right)\left(\frac{x}{x+2}\right)}{h}$$

$$= \lim_{h\to 0} \frac{(x+2)(x+h)-(x+h+2)(x)}{h(x+2)(x+h+2)} = \lim_{h\to 0} \frac{x^2+xh+2x+2h-x^2-xh-2x}{h(x+2)(x+h+2)}$$

$$= \lim_{h\to 0} \frac{2h}{h(x+2)(x+h+2)} = \lim_{h\to 0} \frac{2}{(x+2)(x+h+2)} = \frac{2}{(x+2)^2}$$

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$$f'(-1) = \frac{2}{(-1+2)^2} = \frac{2}{(1)^2} = 2.$$