

1. (7 pts; p 113 #12)

$$\lim_{x \rightarrow -4} \frac{x^2 - x - 20}{x + 4} = \lim_{x \rightarrow -4} \frac{(x + 4)(x - 5)}{x + 4} = \lim_{x \rightarrow -4} x - 5 = -4 - 5 = -9$$

2. (6 pts; p 121 #1) Find a simplified form of the difference quotient $\frac{f(x+h) - f(x)}{h}$ for the function $f(x) = 7x^2$.

$$\begin{aligned} \frac{f(x+h) - f(x)}{h} &= \frac{7(x+h)^2 - 7x^2}{h} = \frac{7(x^2 + 2xh + h^2) - 7x^2}{h} \\ &= \frac{7x^2 + 14xh + 7h^2 - 7x^2}{h} = \frac{14xh + 7h^2}{h} = \frac{h(14x + 7h)}{h} \\ &= 14x + 7h \end{aligned}$$

3. (7 pts; p 121 #8) Find a simplified form of the difference quotient $\frac{f(x+h) - f(x)}{h}$ for the function $f(x) = \frac{4}{x}$.

$$\begin{aligned} \frac{f(x+h) - f(x)}{h} &= \frac{\frac{4}{x+h} - \frac{4}{x}}{h} = \frac{1}{h} \left(\frac{4}{x+h} - \frac{4}{x} \right) \\ &= \frac{1}{h} \left(\frac{4x}{(x+h)x} - \frac{4(x+h)}{(x+h)x} \right) = \frac{1}{h} \left(\frac{4x - 4x - 4h}{(x+h)x} \right) \\ &= \frac{h(-4)}{h(x+h)x} = \frac{-4}{(x+h)x} \end{aligned}$$