2. [13 points] *Throughout this problem, remember to show your work carefully.*

a. [4 points] Find a formula for the quadratic function $g(x)$ described by the table below.

x	-4	1	2	7
$g(x)$	0	-5	-5	0

Solution: We see from the table that the zeros of g are $x = -4$ and $x = 7$. Therefore, a formula for $g((x)$ is given in factored form by $g(x) = a(x+4)(x-7)$ for some constant a. To find a, we use the fact that $g(1) = -5$, so $a(1+4)(1-7) = -5$. Then $-30a = -5$ so $a = \frac{-5}{-30} = \frac{1}{6}$. Thus $g(x) = \frac{1}{6}(x+4)(x-7)$ or, expanding to rewrite this in standard form, we have $g(x) = \frac{1}{6}x^2 - \frac{1}{2}x - \frac{14}{3}$.

Answer: $g(x) =$ $\frac{1}{6}(x+4)(x-7)$ **or** $\frac{1}{6}x^2 - \frac{1}{2}x - \frac{14}{3}$

b. [3 points] Given $f(x) = 13(x-8)^2 + w$, find the average rate of change of f from $x = 8$ to $x = 8+h$. *Simplify your answer completely. Your answer may include h and/or w.*

Solution: The average rate of change of f from $x = 8$ to $x = 8+h$ is given by

$$\frac{f(8+h) - f(8)}{(8+h) - 8} = \frac{\left(13((8+h)-8)^2 + w\right) - \left(13(8-8)^2 + w\right)}{h}$$

$$= \frac{(13h^2 + w) - (0 + w)}{h} = \frac{13h^2 + w - w}{h} = \frac{13h^2}{h} = 13h.$$

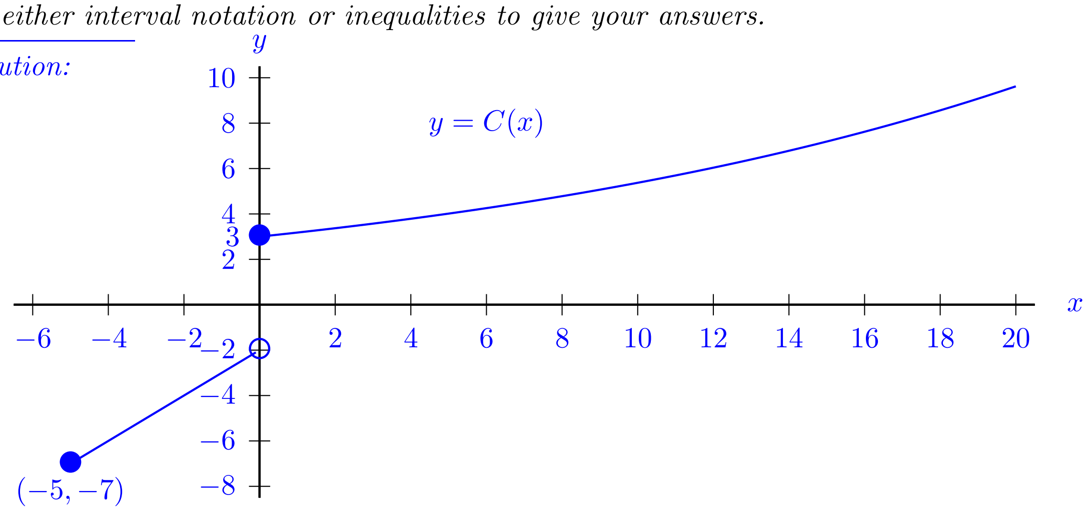
Answer: $13h$

c. [6 points] Consider the function C defined below.

$$C(x) = \begin{cases} -2 + x & \text{if } -5 \le x < 0 \\ 3(1.06)^x & \text{if } 0 \le x. \end{cases}$$

Sketch a graph of $y = C(x)$. Then find the domain and range of this function.
Remember to clearly label your axes.
Use either interval notation or inequalities to give your answers.

Solution:



Domain: $[-5, \infty)$ **Range:** $[-7, -2) \cup [3, \infty)$