

Spring 2025 Laird Homework 11

Instructions: Use desmos.com/calculator to answer the following questions. Round all decimal answers to 4 places.

Desmos Hints:

- Always use x as your independent variable, even if the problem uses a different variable.
 - Use horizontal and vertical lines to identify where a function is equal to a constant.
1. Let f be an increasing function defined for $x > 0$. The function g is given by $g(x) = 0.25x^3 - 9.5x^2 + 110x - 399$. Find the input values of x for which $g(x) = 2$.
 2. Consider the piecewise function W defined by

$$W(t) = \begin{cases} 125 + 0.2t^2 & \text{for } 0 \leq t \leq 20 \\ 165 + 2t & \text{for } t > 20 \end{cases}$$

On which of the following intervals does $W(t)$ have the greatest average rate of change? (Hint: It is not necessary to calculate the AROC for each interval.)

- (a) $1 < t < 2$
 - (b) $10 < t < 11$
 - (c) $17 < t < 18$
 - (d) $24 < t < 25$
3. The average monthly high temperature, in degrees Fahrenheit ($^{\circ}\text{F}$), varies periodically for a certain city. The table gives the average monthly high temperature for selected months of the year, where t is the number of the month.

Month (Value of t)	Temperature ($^{\circ}\text{F}$)
January ($t = 1$)	42.8
April ($t = 4$)	51.3
July ($t = 7$)	67.1
August ($t = 8$)	67.4
October ($t = 10$)	53.8
December ($t = 12$)	42.0

Based on a sinusoidal regression of these data, a model is constructed to predict average monthly high temperature as a function of time t . What is the average monthly high temperature predicted by the model for June ($t = 9$)?

4. The function L is defined by $L(t) = ae^{-0.04t} + b$, where a and b are positive constants. If $L(0) = 12$ and $\lim_{t \rightarrow \infty} L(t) = 1$, for what value of t is $L(t) = 6$?