The Derivatives as Functions

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. Let f be the function recording a car's distance (in miles) from home as a function of t (in hours) that is graphed below. Answer the following:

   (a) How far from home is the car initially?

   (b) When is the car moving away from home?

   (c) Estimate the following $f'(1)$

   $f'(3)$

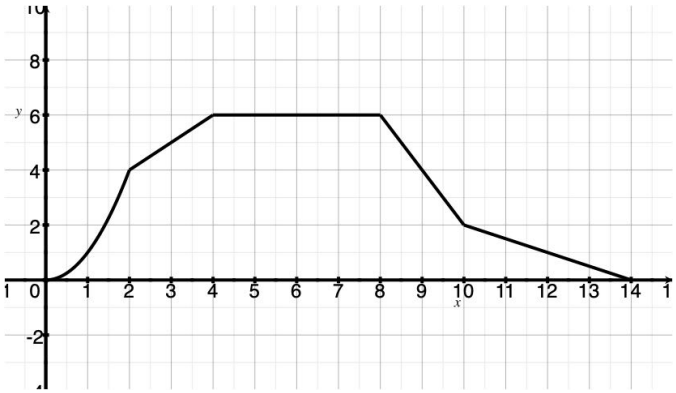
   $f'(5)$

   $f'(6)$

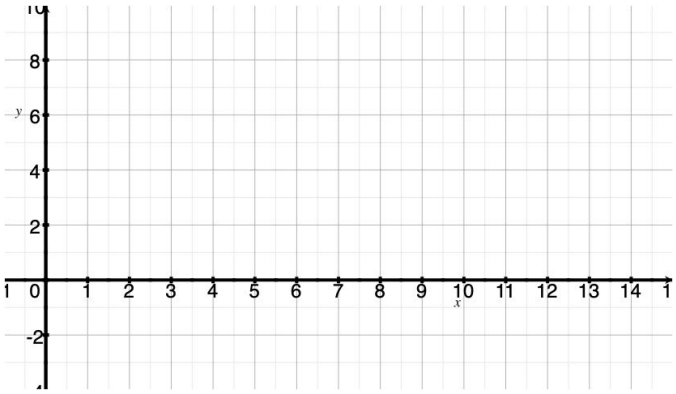
   $f'(7)$

   $f'(8)$

   $f'(9)$



2. Since $f'(12) \approx -\frac{1}{2}$ we could graph the point $(12, -\frac{1}{2})$ on the graph of f'. Use your answers from above to plot points of $f'(x)$ and then sketch the graph.



Recall that the derivative can be algebraically defined as:

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

3. Let $f(t) = -4.9t^2$. Algebraically find the algebraic rule for $f''(x)$.

4. Find the equation of the line tangent to the graph of $y = \frac{1}{x}$ when $x = 1$.

5. Sketch a graph of a function α that satisfies *all* of the following:

   $\alpha(-2) = 4$,
   $\lim_{x \to -2} \alpha(x) = 0$,
   α is continuous on $(0, 5)$,
   $\alpha(-3) = 1$, and
   $\alpha'(3)$ does not exist.