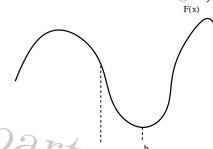


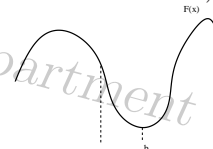
1. Starting at $(a, F(a))$ draw each of the following quantities. Explain your work. (notice there is no axis indicated...)

$$a/b \quad \frac{F(a)+F(b)}{a+b} \quad \frac{F(b)-F(a)}{b-a}$$



2. Starting at $(a, F(a))$ draw each of the following quantities. Explain your work. (notice there is no axis indicated...)

$$b/a \quad \frac{F(a)-F(b)}{b-a} \quad \frac{F(a)-F(b)}{a-b}$$



3. Draw a graph of a non-linear function on a closed interval $[a, b]$, that is equal to the negative of its own derivative, i.e. $f(x) = -f'(x)$. Explain why your answer works, and what the type of linear function that would work would look like.

4. Let f be a function which satisfies $f(x+y) = f(x) + f(y) + 2xy$ for all real numbers x, y , and suppose $\lim_{h \rightarrow 0} \frac{f(h)}{h} = 7$. Find $f(0)$, and also use the definition of derivative to find $f'(x)$. Explain your work.

5. Suppose you know $f'(a) = R, a, R > 0$. If f is an even function, what is $f'(-a)$? Explain.

6. Suppose you know $f'(a) = R, a, R > 0$. If f is an odd function, what is $f'(-a)$? Explain.

7. Let f be defined as below. Find all values of a, b that make f continuous everywhere. Find all values of a, b that would make it differentiable everywhere. Explain why there are / are not any differences in the two sets of values.

$$f(x) = \begin{cases} ax & x \leq 1 \\ bx^2 + x + 1 & x > 1 \end{cases}$$

8. In class we worked the following problem: *Suppose you park at the trailhead and begin a 2 hour hike at 0700 Friday morning. On Sunday morning you leave at 0700 and hike 2 hours back to your car. Suppose the trail is 6 miles long. Explain the difference between that problem and the one below. Also, would the conclusion we reached in class still apply? Explain. **Rob starts at the trail head at 0700 Friday. 30 minutes in to his trip, he teleports ahead 100 meters, then finishes walking the trail, arriving at 0900. On the return trip that again starts at 0700, again 30 minutes into his trip he teleports ahead 100 meters, then finishes walking the trail, arriving at 0900.***

9. Let f satisfy (i) $f(x+y) = f(x)f(y)$ (ii) $f(0) \neq 0$ (iii) $f'(0) = 1$ Show and explain why $f(0) = 1$ and $f(x) \neq 0$ for all x . Also, use the definition of derivative to find $f'(x)$.

10. Let g_1, g_2 satisfy (i) $g(x+y) = g(x)g(y)$ (ii) $g(0) \neq 0$ (iii) $g'(0) = 1$, and let $R(x) = g_1(x)/g_2(x)$ Is there anywhere $R(x)$ is not defined? Explain. Find $R'(x)$ also.