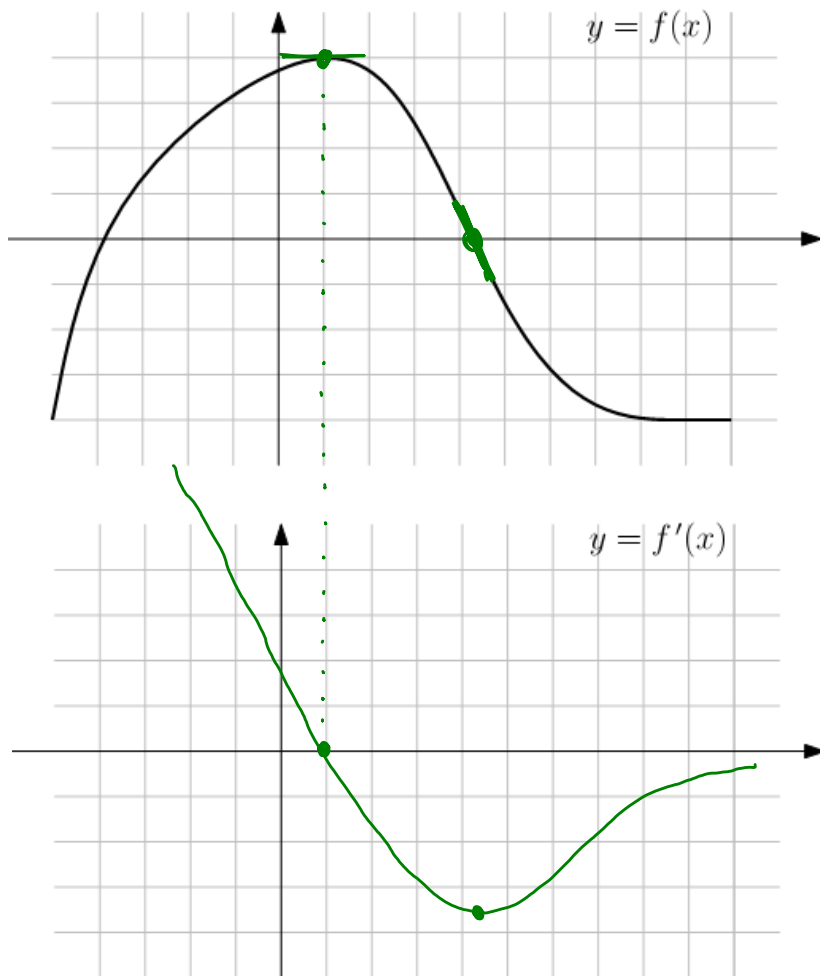


Show your work in all problems.

1. Sketch the derivative of
- $y = f(x)$
- on the axes below.



2. The amount of caffeine in Jackie's bloodstream is given by
- $C = f(t)$
- milligrams where
- $t$
- is minutes since noon. Interpret the following in terms of the problem.

(a)  $f(15) = 250$

At 12:15pm there was 250mg caffeine in her bloodstream.

(b)  $f'(15) = -10$

Around 12:15pm, the amount of caffeine decreases by 10mg every minute.

3. Find the derivative of
- $f(x) = 5x + x^2$
- algebraically. (no other method will receive points)

$$\begin{aligned}
 f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{5(x+h) + (x+h)^2 - (5x + x^2)}{h} \\
 &= \lim_{h \rightarrow 0} \frac{\cancel{5x} + 5h + \cancel{x^2} + 2xh + h^2 - \cancel{5x} - \cancel{x^2}}{h} \\
 &= \lim_{h \rightarrow 0} \frac{\cancel{h}(5 + 2x + h)}{\cancel{h}} \\
 &= \lim_{h \rightarrow 0} 5 + 2x + h = \boxed{5 + 2x = f'(x)}
 \end{aligned}$$