

4. (8 pts) A function  $g(x)$  is graphed below, together with its tangent line when  $x = 2$ .

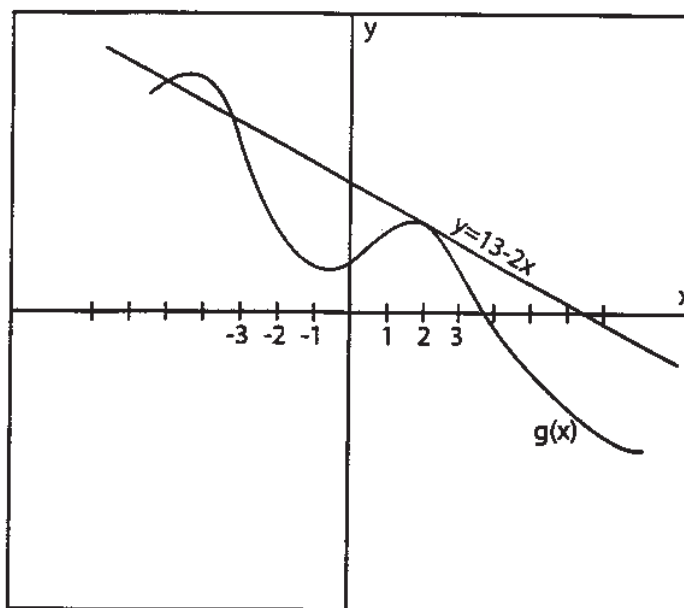


Figure 1:  $g(x)$  with tangent line

- a) What is the value of  $g(2)$ ?

$g(2) = 9$ , since the tangent line crosses the graph of  $g(x)$  at the point  $(2, g(2))$ .

- b) What is the value of  $g'(2)$ ?

$g'(2) = -2$ , since this is the slope of the tangent line to the graph of  $g(x)$  at the point  $(2, g(2))$ .

- c) Does the limit  $\lim_{h \rightarrow 0} \frac{g(2+h) - g(2)}{h}$  exist? If so, what is its value? If not, explain why not.

This expression,  $\lim_{h \rightarrow 0} \frac{g(2+h) - g(2)}{h}$ , is the definition

using limits of the derivative  $g'(x)$  at  $x = 2$ .

We are told  $g(x)$  has a derivative at  $x = 2$ , so this limit exists. Part (b) says it equals  $-2$  when  $x = 2$ .