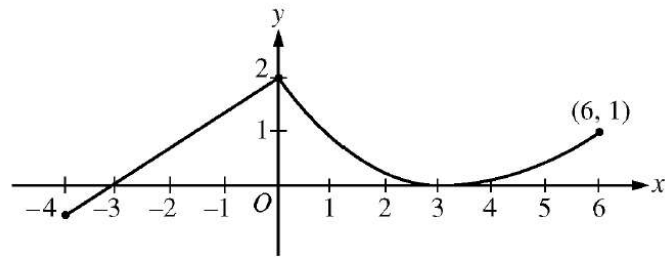


## AP Differentiability FRQs

Graph of  $f$ 

3. A continuous function  $f$  is defined on the closed interval  $-4 \leq x \leq 6$ . The graph of  $f$  consists of a line segment and a curve that is tangent to the  $x$ -axis at  $x = 3$ , as shown in the figure above. On the interval  $0 < x < 6$ , the function  $f$  is twice differentiable, with  $f''(x) > 0$ .

- (a) Is  $f$  differentiable at  $x = 0$ ? Use the definition of the derivative with one-sided limits to justify your answer.

Suppose the function  $g$  is defined by

$$g(x) = \begin{cases} k\sqrt{x+1} & \text{for } 0 \leq x \leq 3 \\ mx + 2 & \text{for } 3 < x \leq 5, \end{cases}$$

where  $k$  and  $m$  are constants. If  $g$  is differentiable at  $x = 3$ , what are the values of  $k$  and  $m$ ?