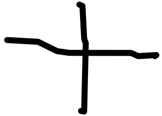
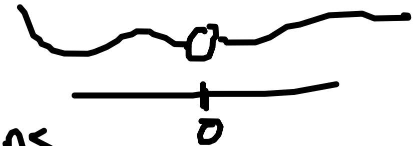
1. Which of the following statements, if true, cannot be used to conclude that $f(0)$ exists?



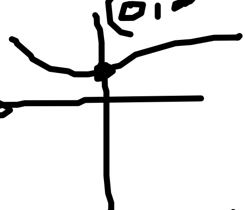


(A) $\lim_{x \to 0} f(x)$ exists.

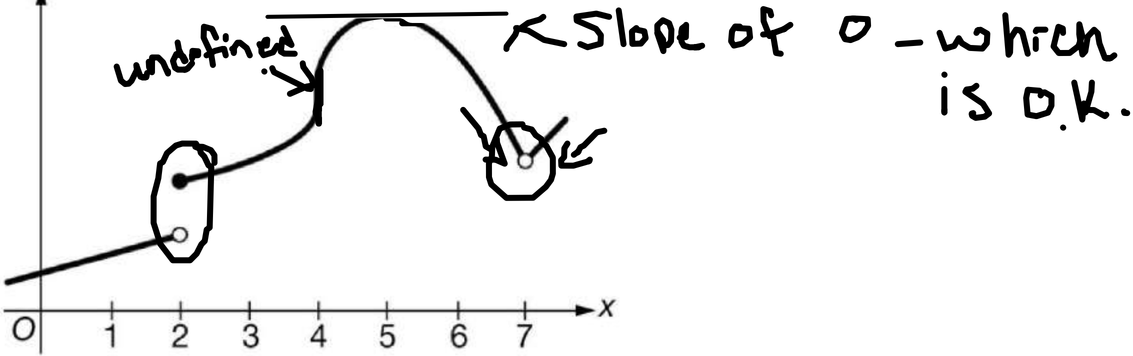
(B) f is continuous at $x = 0$. True - helps

(C) f is differentiable at $x = 0$. True - helps

(D) The graph of f has a y-intercept. True - helps



A limit does not guarantee that a point exists.



Graph of f

The figure above shows the graph of a function f, which has a vertical tangent at $x = 4$ and a horizontal tangent at $x = 5$. Which of the following statements is false?

(A) f is not differentiable at $x = 2$ because the graph of f has a jump discontinuity at $x = 2$. True

(B) f is not differentiable at $x = 4$ because the graph of f has a vertical tangent at $x = 4$. True

(C) f is not differentiable at $x = 5$ because the graph of f has a horizontal tangent at $x = 5$.

(D) f is not differentiable at $x = 7$ because the graph of f has a removable discontinuity at $x = 7$. True

$-(5)^2+20$

$-25+20=-5$

5. $f(x)=\begin{cases} x^2-20 & \text{for } x<5 \\ -x^2+20 & \text{for } x\geq 5 \end{cases}$

Let f be the function defined above. Which of the following statements is true?

(A) f is not differentiable at $x=5$ because f is not continuous at $x=5$.

(B) f is not differentiable at $x=5$ because the graph of f has a sharp corner at $x=5$.

(C) f is not differentiable at $x=5$ because the graph of f has a vertical tangent at $x=5$.

(D) f is not differentiable at $x=5$ because f is not defined at $x=5$.

$\boxed{f(5)=-5}$ $\quad \lim\limits_{x\to 5^-} \dfrac{x^2-20--5}{x-5}$ $\quad \lim\limits_{x\to -5^-} \dfrac{x^2-25}{x-5}$

$\lim\limits_{x\to 5^-} \dfrac{\cancel{(x-5)}(x+5)}{\cancel{x-5}} = 5+5=10$ $\quad \boxed{\lim\limits_{x\to 5^-} f(x)=10}$