Directions: For each function f described in 1-4, first decide whether the IVT & EVT are guaranteed, and then determine whether each lettered statement below "**must** be true" or "**might** be true" and provide justification.

1) *f is continuous for $a \le x \le b$ and differentiable for $a < x < b$.*

	Guaranteed?	Why or why not?
Intermediate Value Theorem (IVT)		
Extreme Value Theorem (EVT)		
Mean Value Theorem (MVT)		

Must be true or might be true? Justify your answer.

a. $f'(c) = \frac{f(b)-f(a)}{b-a}$ for some c such that $a < c < b$.

b. $f(c) = 0$ for some c such that $a < c < b$.

c. There is a number c in the closed interval $[a, b]$ such that $f(c) \le f(x)$ for all x in $[a, b]$.

2) *The function f is continuous for $-2 \le x \le 1$, differentiable for $-2 < x < 1$, $f(-2) = 5$, and $f(1) = -4$.*

	Guaranteed?	Why or why not?
Intermediate Value Theorem (IVT)		
Extreme Value Theorem (EVT)		
Mean Value Theorem (MVT)		

Must be true or might be true? Justify your answer.

a. There exists c, where $-2 < c < 1$, such that $f'(c) = 0$.

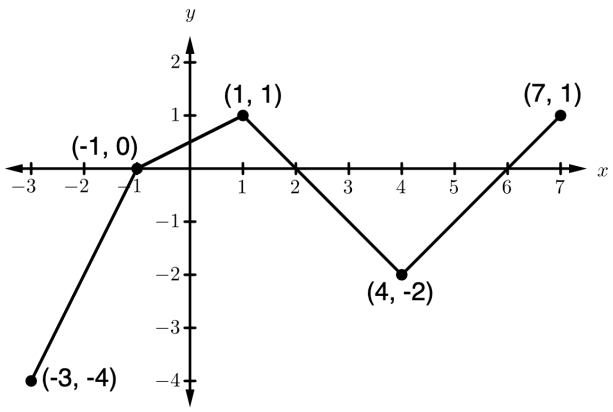
b. There exists c, where $-2 < c < 1$, such that $f'(c) = -3$.

c. There exists c, where $-2 < c < 1$, such that $f(c) = -3$.

3) Let f be a differentiable function such that $f(2) = 5$ and $f(5) = 2$.
Explain why there must be a value c for $2 < c < 5$ such that $f'(c) = -1$.

x	$f(x)$	$g(x)$
1	6	2
2	9	3
3	10	4
4	-1	6

4) The functions f and g are differentiable for all real numbers. The table gives values of the functions at selected values of x. The function h is given by $h(x) = f\big(g(x)\big) - 6$.
Explain why there must be a value c for $1 < c < 3$, such that $h'(c) = -5$.



5) The graph of the piecewise-linear function g is shown above for $-3 \le x \le 7$.
Find the average rate of change of $g(x)$ on the interval $-3 \le x \le 7$. Does the Mean Value Theorem applied on the interval $-3 \le x \le 7$ guarantee a value of c, for $-3 < c < 7$, such that $g'(c)$ is equal to this average rate of change? Why or why not?