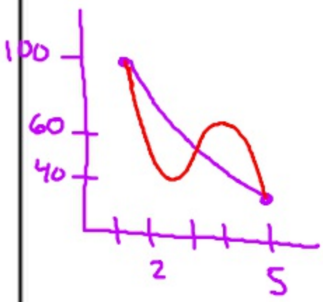
Differentiable: Function is continuous and has a slope

Intermediate Value Theorem → continuous interval, values at end of interval

t (minutes)	0	2	5	8	12
$v_A(t)$ (meters/min)	0	100	40	-120	-150

Velocity → $v_A(t)$

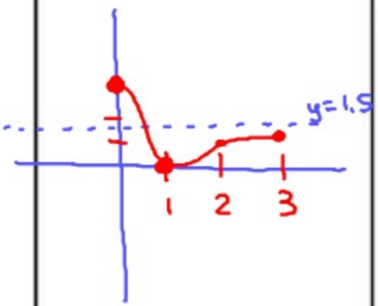


1(FR). Train A runs back and forth on an east-west section of railroad track. Train A's velocity, measured in meters per minute, is given by a differentiable function $v_A(t)$, where time t is measured in minutes. Selected values for $v_A(t)$ are given in the table above.

b) Do the data in the table support the conclusion that train A's velocity is 60 meters per minute at some time t with $2 < t < 5$? Give a reason for your answer.

yes, because $V_A(t)$ is continuous from $2<t<5$ and $v(2)=100$ and $v(5)=40$.

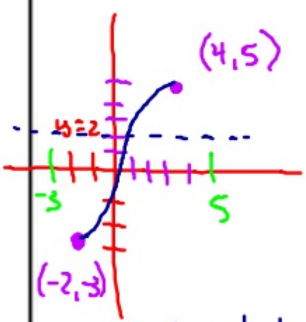
x	0	1	2	3
f(x)	3	0	k	1



2(MC). The function f is continuous on the closed interval [0, 3] and has values that are given in the table above. The equation f(x) = 1.5 must have at least 3 solutions in the [0, 3] if k =

y = 1.5

A) -1 B) 0 C) .5 D) 1 E) 2



3(MC). Let f be a continuous function on the closed interval [-2, 4]. If f(-2) = -3 and f(4) = 5, then the Intermediate Value Theorem guarantees that

~~A)~~ f(c) = 1 for at least one c between -3 and 5

c = x

B) $-3 \leq f(x) \leq 5$ for all x between -2 and 4

slope = 4/3

~~C)~~ $f'(c) = \frac{4}{3}$ for at least one value of c between -2 and 4

~~D)~~ f(1) = 2

E) f(c) = 2 for at least one c between -2 and 4

y-values between -3 and 5

y=2

Since f and g are continuous from $2 < r < 4$ and $h(2) = 4$ and $h(4) = 7$

The functions f and g are $\boxed{\text{differentiable}}$ for all real numbers, and g is strictly increasing. The table gives values of the functins and their first derivatives (their slopes) at selected values of x. the function h is given by h(x) = f(g(x)) - 6

x	f(x)	$f'(x)$ slope	g(x)	$g'(x)$ slope
1	6	3	2	1
2	9	1	3	1
3	10	4	4	2
4	11	1	6	6
5	12	1	12	6
6	13	2	18	7

4(FR) Explain why there must be a value r for $2 < r < 4$ such that h(r) = 5.

$2 < x < 4$ $\quad y = 5$

$h(x) = f(g(x)) - 6$

$h(2) = f(g(2)) - 6$
$= f(3) - 6$
$= 10 - 6$
$= 4$

$h(4) = f(g(4)) - 6$
$= f(6) - 6$
$= 13 - 6$
$= 7$

t (hours)	0	1	3	4	7	8	9
$L(t)$ (people)	120	156	176	126	150	80	0

5(FR). Concert tickets went on sale at noon (t = 0) and were sold out within 9 hours. The number of people waiting in line to purchase tickets at time t is modeled by the differentiable function L for $0 \le t \le 9$. Values of L(t) at various times t are shown in the table above.
How many times during the $\boxed{\text{last 5 hours}}$ will L(t) equal 130? Give a reason for your answer.

Guaranteed to have at least two times because L(t) is continuous from $0 \le t \le 9$ and $L(4) = 126$ and $L(7) = 150$ and $L(9) = 0$