Practice Quiz on Rolle's Theorem and MVT

1. Consider the function
$$f(x) = \frac{2}{x-2} \qquad \text{on} \quad [1,3]$$
State why Rolle's Theorem does NOT apply to this function on the given interval. (There might be more that one reason.)

   (a) f is not continuous at $x = 2$.

   (b) f is not defined at $x = 2$ and $x = 0$.

   (c) f is not differentiable at $x = 2$.

   (d) $f(1) \neq f(3)$

2. Choose the reasons which states why the Mean Value Theorem does NOT apply to the function $f(x) = \dfrac{2x}{(x+2)^2}$ on the interval $[1,3]$. (There might be more than one reason.)

   (a) f is not continuous at $x = -2$.

   (b) f is not defined at $x = -2$ and $x = 0$.

   (c) f is not differentiable at $x = -2$.

   (d) $f(1) \neq f(3)$

   Can you change the interval so that MVT applies? If yes, write the interval.

3. Consider the function
$$h(x) = |x|$$
Your friend claims that since $h(2) = h(-2) = 2$, we can apply Rolle's Theorem to deduce that there is a number c in $[-2,2]$ such that
$$h'(c) = \frac{h(2) - h(-2)}{2 - (-2)} = 0$$
and therefore the tangent line at $x = c$ is horizontal.

   Do you agree with your friend's claim? Give reasons.

Test Yourself.

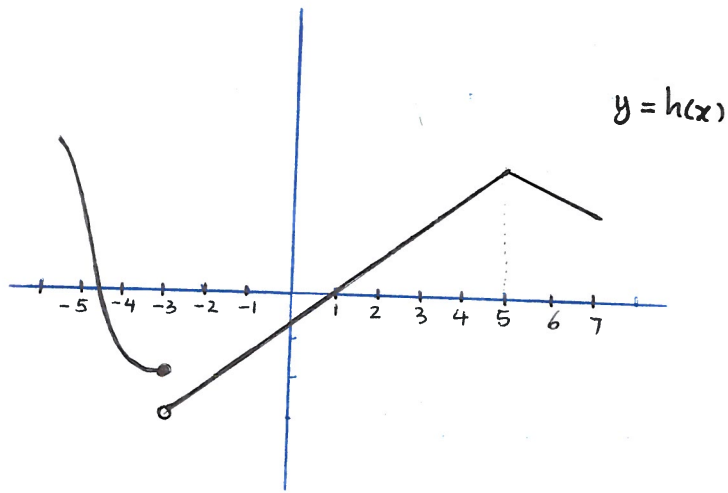
(1) On which of the following intervals MVT applies to the function h over the interval ?

1) $[-5,1]$

2) $[-1,3]$

3) $[3,7]$

4) $[-3,2]$



(2) The following table gives a few values of function h.

x	-3	-2	-1	0
$h(x)$	-6	-1	-4	-5

Your friend said that since

$$\frac{h(0)-h(-2)}{0-(-2)} = \frac{-5-(-1)}{2} = -2$$

So there must be a number "c" in the interval $[-2,0]$ for which $h'(c) = -2$.

Is this claim true ? If Yes give reasons , if No complete the claim so that it becomes true .