MVT, IVT, and EVT Worksheet

For problems 1-8, determine if the Mean Value Theorem applies to the function on the given interval. If it does, find the c-value. If it doesn't, explain why not.

1. $f(x) = |x|$ $[-1, 3]$

2. $f(x) = x^2 - 2x$ $[1, 3]$

3. $f(x) = x^2 - 3x + 2$ $[1, 2]$

4. $f(x) = x^{2/3}$ $[-2, 2]$

5. $f(x) = \dfrac{1}{x-4}$ $[2, 6]$

6. $f(x) = \dfrac{x^2 - x}{x}$ $[-1, 1]$

7. $f(x) = \sin x$ $[0, \pi]$

8. $f(x) = \tan x$ $[0, \pi]$

For problems 9-13, determine if the Intermediate Value Theorem would guarantee a c-value on the given interval.

9. $f(x) = x^2 + x - 1$ $\qquad f(c) = 11 \qquad [0,5]$

10. $f(x) = \dfrac{x}{x-1}$ $\qquad f(c) = 1 \qquad [0,2]$

11. $f(x) = |x|$ $\qquad f(c) = 3 \qquad [-4,1]$

12. $f(x) = \begin{cases} x & x \le 1 \\ 3 & x > 1 \end{cases}$ $\qquad f(c) = 2 \qquad [0,4]$

13. $f(x) = \dfrac{x^2 + x}{x-1}$ $\qquad f(c) = 6 \qquad [\tfrac{5}{2},4]$

For problems 14-16, find the c-values for the given problem.

14. Problem 9

15. Problem 11

16. Problem 13

For Problems 17-21, use the table below with selected values of the twice differentiable function k. Reach each explanation and decide whether you would apply IVT, EVT, or MVT.

x	1	2	3	4	5	6	7
$k(x)$	5	2	-4	-1	3	2	0

17. Since k is differentiable, it is also continuous. Since $k(6)=2$ and $k(7)=0$, and since 1 is between 2 and 0, it follows by ________ that $k(c)=1$ for some c between 6 and 7.

18. Since k is differentiable and, therefore, also continuous, and since $\frac{k(3)-k(2)}{3-2}=-6$, it follows by ________ that $k'(c)=-6$ for some c in the interval $(2,3)$.

19. There must be a minimum value for k at some r in $[1,7]$, because k is differentiable and, therefore, also continuous. Hence the _________ applies.

20. There must be some value a in $(2,6)$ for which $k'(a)=0$, because $k(2)=k(6)$, and since k is differentiable, the __________ applies.

21. Since k is differentiable, the _________ guarantees some a in $(4,5)$ for which $k'(a)=4$ and also some b in $(5,6)$ for which $k'(b)=-1$. Then since k' is differentiable, and therefore also continuous, it follows by the __________ applied to k' that $k'(c)=0$ for some c in (a,b) and therefore in $(4,6)$.