1.3

Intermediate Value Theorem Practice

Name ______________________

Date ______________ Period ________

Problems 1 – 13, Use the Intermediate Value Theorem to complete.

1. In the function $f(x) = x^3 - x - 1$, it can be shown that $f(1) = -1$ and $f(2) = 5$. Complete the table below to find an approximation for a solution of the interval $[1, 2]$.

x	1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
$f(x)$											

2. Find the value of c guaranteed by the Intermediate Value Theorem. $f(x) = x^2 + 4x - 13$ on $[0, 4]$ such that $f(c) = 8$

3. Show that $g(x) = 2x^3 - 5x^2 - 10x + 5$ has a root somewhere in the interval $[-1, 2]$.

4. Between which of the following two values does the equation $3x^3 + 5x - 11 = 0$ have a solution?

(A) $[-2, -1]$ **(B)** $[0, 1]$ **(C)** $[-1, 0]$ **(D)** $[1, 2]$

5. Given the function $f(x) = \frac{2x-3}{2x-5}$, determine which interval(s) satisfies the conditions for the Intermediate Value Theorem, such that $f(x) = 0$.

(A) One solution between x = 0 and x = 1

(B) One solution between $x = 1$ and $x = 2$

(C) One solution between $x = 1$ and $x = 2$ and one solution between $x = 2$ and $x = 3$

(D) One solution between $x = 2$ and $x = 3$

6. Apply the Intermediate Value Theorem, if possible, on [1, 2] so that $f(c) = 9$ for the function $f(x) = x^3 + x$.

7. A delivery van travels along a straight road. During the time interval $0 \leq t \leq 30$ seconds, the van's velocity in feet per second is a continuous function. Use the table below to find the minimum number of times that the van must have been stopped. Justify your answer.

t **(sec)**	0	5	7	12	18	22	30
$V(t)$ **(ft/sec)**	-28	-60	-15	8	24	-4	10

8. Explain why the Intermediate Value Theorem does not apply for guaranteeing that a zero exists for the function $f(x) = x^2 + 2x + 5$ over [0, 6].

9. The functions f and g are continuous. The function h is given by $h(x) = f(g(x)) - x$. The table below gives values of the functions. Explain why there must be a value c for $1 < c < 5$ such that $h(c) = -2$.

x	1	2	3	4	5
$f(x)$	0	9	7	-3	8
$g(x)$	4	6	-4	1	3

10. Given $f(x) = \frac{x}{x-3}$ on the interval $[-2, 2]$. Determine if the IVT applies. State why or why not. Then, find the value of c such that $f(c) = \frac{1}{3}$.

11. Show that there is a value c with $0 < c < 2$ such that $x^2 + \cos \pi x = 4$. Then, use a graphing utility to find the approximate value of c.

12. Does the IVT apply to the function $h(x) = \frac{x^2+x}{x-2}$ on the interval $[2.5,\ 5]$? If so, find the value of c guaranteed to exist, such that $h(c) = 12$.

13. Does the IVT apply to the function $f(x) = -\left(\frac{1}{2}\right)^{3-x} - 3$ on the interval $[2,5]$ for $f(c) = -4$?

________ **14.** Let f be a continuous function on the closed interval $[-2, 7]$. If $f(-2) = -3$ and $f(7) = 4$, then the Intermediate Value Theorem guarantees that

(A) $f(0) < 0$

(B) $-3 \leq f(x) \leq 4$ for all x between -2 and 7.

(C) $f(c) = 1$ for at least one c between -2 and 7

(D) $f(c) = 0$ for at least one c between -3 and 4