INTERMEDIATE VALUE THEOREM WORKSHEET

Key (Odds)

In 1-4, explain why the function has a zero in the given interval.

1	$f(x)=\frac{1}{16}x^4-x^3+3$; $[1,2]$	$f(1)=\frac{33}{16}$ $f(2)=-4$ Since $f(x)$ is cont. on $[1,2]$ & $f(1)=\frac{33}{16}$ & $f(2)=-4$, there is at least 1 value of x where $f(x)=0$.
2	$f(x)=x^3+3x-2$; $[0,1]$	
3	$f(x)=x^2-x-\cos x$; $[0,\pi]$	$f(0)=-1$ $f(\pi)=7.728$ SAME REASON AS #1
4	$f(x)=-\frac{4}{x}+\tan\left(\frac{\pi x}{8}\right)$; $[1,3]$	

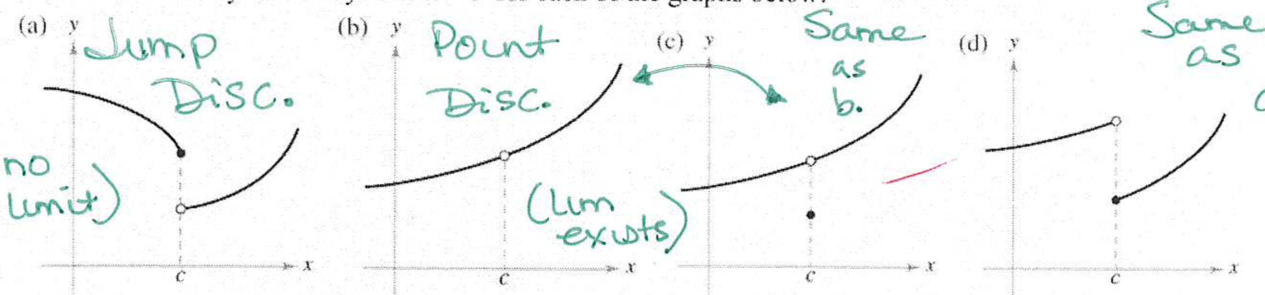
In 5-8, verify that the Intermediate Value Theorem guarantees that there is a zero in the interval $[0,1]$ for the given function. Use a graphing calculator to find the zero.

5	$f(x)=x^3+x-1$	$f(0)=-1$ $f(1)=1$ SAME REASON AS #1 $x=.682$
6	$f(x)=x^3+3x-2$	
7	$g(t)=2\cos t-3t$	$f(0)=2$ $f(1)=-1.919$ $x=0.524$
8	$h(\theta)=1+\theta-3\tan\theta$	

In 9-12, verify that the Intermediate Value Theorem applies to the indicated interval and find the value of c guaranteed by the theorem. No calculator is permitted on these problems.

9	$f(x)=x^2+x-1$, $[0,5]$, $f(c)=11$	$f(0)=-1$ $f(5)=29$ $x^2+x-1=11$, $x^2+x-12=0$, $(x+4)(x-3)=0$, $x=-4$, $x=3$; $x=3$
10	$f(x)=x^2-6x+8$, $[0,3]$, $f(c)=0$	
11	$f(x)=x^3-x^2+x-2$, $[0,3]$, $f(c)=4$	$f(0)=-2$ $f(3)=19$ $x^3-x^2+x-2=4$, $x^3-x^2+x-6=0$, $x=2$
12	$f(x)=\frac{x^2+x}{x-1}$, $\left[\frac{5}{2},4\right]$, $f(c)=6$	

13 State how continuity is destroyed at $x=c$ for each of the graphs below:



(a) Jump Disc. (no limit)
(b) Point Disc. (lim exists)
(c) Same as b.
(d) Same as a.

15	Show that $f(x)$ is continuous at $x=2$ for $f(x)=\begin{cases}5-x, & -1\le x\le 2\\ x^2-1, & 2<x\le 3\end{cases}$
16	Determine whether $f(x)$ is continuous at $x=-1$ for $f(x)=\begin{cases}\frac{1}{x}, & x\le -1\\ \frac{x-1}{2}, & -1<x<1\\ \sqrt{x}, & x\ge 1\end{cases}$

$\lim_{x\to 2^-} 5-x=3$

$\lim_{x\to 2^+} x^2-1=3$

$\lim_{x\to 2} f(x)=3$

$f(2)=3$

$\therefore$ $f(x)$ is continuous at $x=2$ because $\lim_{x\to 2} f(x)=f(2)$