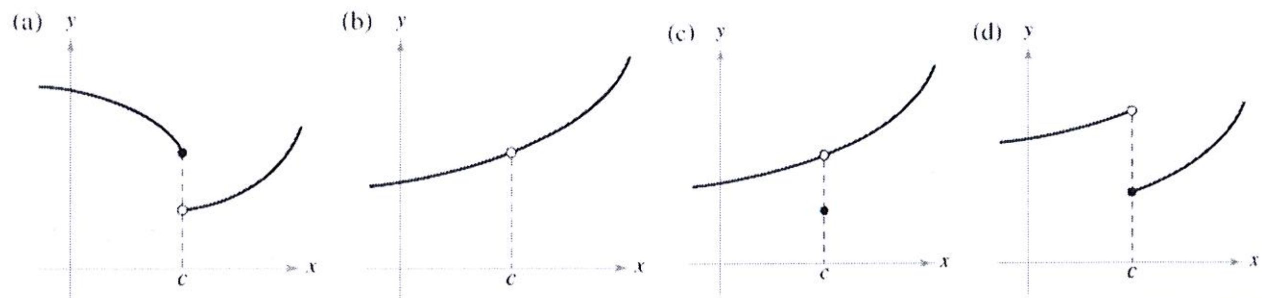
In 1-4, explain why the function has a zero in the given interval.	
1	$f(x)=\frac{1}{16}x^4-x^3+3;\ [1,2]$
2	$f(x)=x^3+3x-2;\ [0,1]$
3	$f(x)=x^2-x-\cos x;\ [0,\pi]$
4	$f(x)=-\frac{4}{x}+\tan\left(\frac{\pi x}{8}\right);\ [1,3]$

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	$f(x)=x^3+x-1$
6	$f(x)=x^3+3x-2$
7	$g(t)=2\cos t-3t$
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	$f(x)=x^2+x-1,\quad [0,5],\quad f(c)=11$
10	$f(x)=x^2-6x+8,\ [0,3],\ f(c)=0$
11	$f(x)=x^3-x^2+x-2,\ [0,3],\ f(c)=4$
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:



14 Use the Intermediate Value Theorem to show that for all spheres with radii in the interval $[1,5]$, there is one with a volume of 275 cubic centimeters.

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 $f(x)=\begin{cases}\frac{1}{x}, & x\le -1\\ \frac{x-1}{2}, & -1<x<1\\ \sqrt{x}, & x\ge 1\end{cases}$

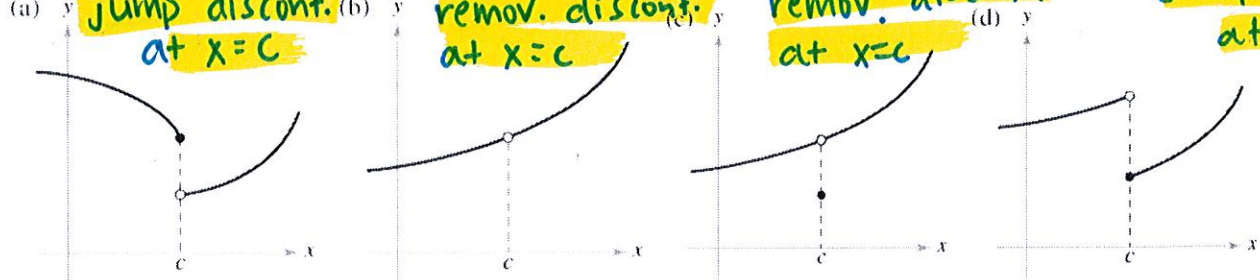
In 1-4, explain why the function has a zero in the given interval.	
1	$f(x)=\frac{1}{16}x^4-x^3+3$; $[1,2]$ since $f(1)=\frac{33}{16}$ (+) $f(2)=-4$ and $f(x)$ is continuous, then $f(c)=0$
2	$f(x)=x^3+3x-2$; $[0,1]$ since $f(0)=-2$ + $f(1)=2$ and $f(x)$ is continuous, then $f(c)=0$
3	$f(x)=x^2-x-\cos x$; $[0,\pi]$ since $f(0)=-1$ + $f(\pi)=\pi^2-\pi+1$ (+#) and $f(x)$ is continuous, then $f(c)=0$
4	$f(x)=-\frac{4}{x}+\tan\left(\frac{\pi x}{8}\right)$; $[1,3]$ $f(1)=-3.586$ + $f(3)=1.081$ By IVT, there is a zero

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	$f(x)=x^3+x-1$ $f(0)=-1$ + $f(1)=1$ $f(.682)=0$
6	$f(x)=x^3+3x-2$ $f(0)=-2$ + $f(1)=2$ $f(.596)=0$
7	$g(t)=2\cos t-3t$ $g(0)=2$ + $g(1)=2\cos 1-3=-1.919$ $g(.563)=0$
8	$h(\theta)=1+\theta-3\tan\theta$ $h(0)=1$ + $h(1)=$ $h(0.45)=0$

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	$f(x)=x^2+x-1$, $[0,5]$, $f(c)=11$ $f(0)=-1$ + $f(5)=29$ $x^2+x-1=11$ $x^2+x-12=0$ $(x+4)(x-3)=0$ $c=3$
10	$f(x)=x^2-6x+8$, $[0,3]$, $f(c)=0$ $f(0)=8$ + $f(3)=-1$ $x^2-6x+8=0$ $(x-4)(x-2)=0$ $c=2$
11	$f(x)=x^3-x^2+x-2$, $[0,3]$, $f(c)=4$ $f(0)=-2$ + $f(3)=19$ $x^3-x^2+x-2=4$ $x^3-x^2+x-6=0$ $c=2$
12	$f(x)=\frac{x^2+x}{x-1}$, $\left[\frac{5}{2},4\right]$, $f(c)=6$ $f(5/2)=5/2=2.5$ $f(4)=20/3=6.666$ $\frac{x^2+x}{x-1}=6$ → $x^2+x=6x-6$ $x^2-5x+6=0$ $(x-3)(x-2)=0$ $c=3$

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

(a) jump discont. at $x=c$ (b) remov. discont. at $x=c$ (c) remov. discont. at $x=c$ (d) jump. discont. at $x=c$



14 Use the Intermediate Value Theorem to show that for all spheres with radii in the interval $[1,5]$, there is one with a volume of 275 cubic centimeters. $V=\frac{4}{3}\pi r^3$ $V(1)=4.189$ $V(5)=523.599$ so $V(c)=275$

15 Show that $f(x)$ is continuous at $x=2$ for $f(x)=\begin{cases}\boxed{5-x,} & -1\le x\le 2\\ \boxed{x^2-1,} & 2<x\le 3\end{cases}$.

set equal to each other + plug in $x=2$

$\lim_{x\to 2} f(x)=f(2)$
$3=5-2$
$3=3$ ✓

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

set equal to each other + plug in $x=-1$

$\lim_{x\to -1} f(x)=f(-1)$
$\frac{-1-1}{2}=-\frac{1}{1}$
$-1=-1$ ✓

yes