JANUARY 13

Explain how you can tell from the function definition (the equation) whether a piecewise function is continuous.

JANUARY 13

Students will verbally explain how to find discontinuities and create continuous piecewise functions

(using the words:
domain, curve, defined...)

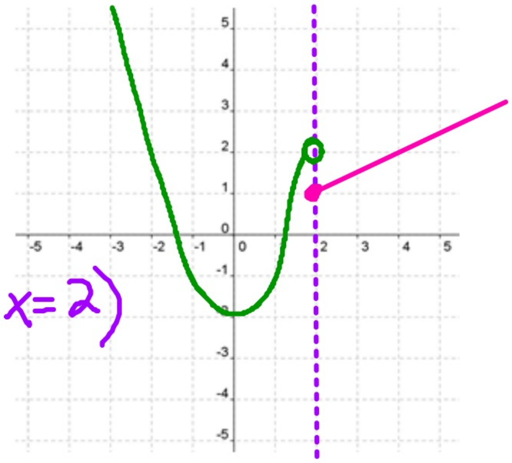
OK, now. You've bought avocadoes at a Real Grocery store. You've matched graphs to piecewise functions. It's time for the biggest challenge of all. Pick your favorite number from the set of numbers {1, 2, 3, 4, 5}. Write it down. 2

For the next problem k stands for your favorite number (written above), and g(x) is the piecewise function defined below.

$$g(x)=\begin{cases}0.5x \text{ for } x\geq 2\\ x^2-k \text{ for } x<2\end{cases}$$

x^2-2

Graph g(x).



Is g(x) continuous?

no

For what value of k would g(x) be continuous?

$0.5x = x^2 - K$ (when $x=2$)

$0.5(2)=2^2-K$

$1=4-K$

$-4 \quad -4$

$-3=-K \longrightarrow K=3$

$$h(x)=\begin{cases}\sin x \text{ for } x\geq 0\\ \cos x + k \text{ for } x<0\end{cases}$$

$\sin x = \cos x + K$ (when $x=0$)

$\sin(0)=\cos(0)+K$

$0 = 1+K$

$-1 \quad -1$

$-1 = K$

$$h(x)=\begin{cases}x^2+k \text{ for } x\leq 2\\ x^3 \text{ for } x>2\end{cases}$$

$x^2+K=x^3$ (when $x=2$)

$2^2+K=2^3$

$4+K=8$

$K=4$

$$h(x)=\begin{cases}x^3-2x-5 \text{ for } x<2\\ x^2+x+k \text{ for } x\geq 2\end{cases}$$

$K=-7$

$$h(x)=\begin{cases}2x^2 \text{ for } x\geq -1\\ kx \text{ for } x<-1\end{cases}$$

$K=-2$

$2x^2=Kx$ (when $x=-1$)

$2(-1)^2=K(-1)$

$2(1)=-K$

$\frac{2}{-1}=\frac{-K}{-1} \to K=-2$

Find the value of k that makes the function continuous.	$h(x)=\begin{cases} x^2+k \text{ for } x\le 2 \\ x^3 \text{ for } x>2 \end{cases}$ $x^2+K=x^3$ (when $x=2$) $2^2+K=2^3$ $4+K=8$ $K=4$ ① set the equations equal ② plug the transition point in for x ③ simplify + solve for K

$g(x)=\begin{cases} x+a, & x<1 \\ x^2, & 1\le x<9 \\ b\sqrt{x}, & x\ge 9 \end{cases}$ find values for a + b so that g(x) is continuous	$x+a=x^2$ (when $x=1$) $1+a=1^2$ $1+a=1$ $a=0$ $x^2=b\sqrt{x}$ (when $x=9$) $9^2=b\sqrt{9}$ $\frac{81}{3}=\frac{3b}{3}$ $27=b$

Discontinuous function

a function that is not continuous

→ at a point ($f(x)=\frac{1}{x}$ is not continuous at $x=0$)

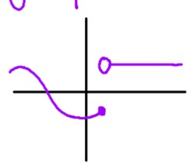
→ on an interval ($g(x)=\sqrt{x}$ is not continuous for $x<0$)

there are value(s) that are not in the domain

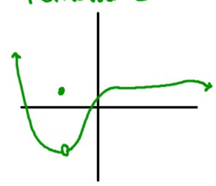
→ break in the domain

3 types of discontinuities

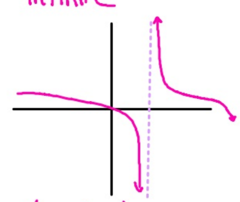
jump



removable



infinite



(vertical asymptotes)

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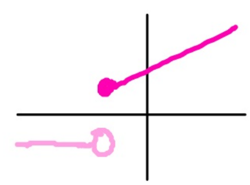
Right Continuous

continuous from the right of the transition point, t

(values greater than t)

$x \geq t$



Left Continuous

continuous from the left of the transition point, t

(values less than t)

$x \leq t$

Assignment #1
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