

Spot the Break

Read graphs for continuity and discontinuities.

HIGH SCHOOL • MA.912.C.1.10

MA.912.C.1.10 "Given the graph of a function, identify whether a function is continuous at a point. If not, identify the type of discontinuity for the given function."

NAME _____

DATE _____

CHECK THREE CONDITIONS

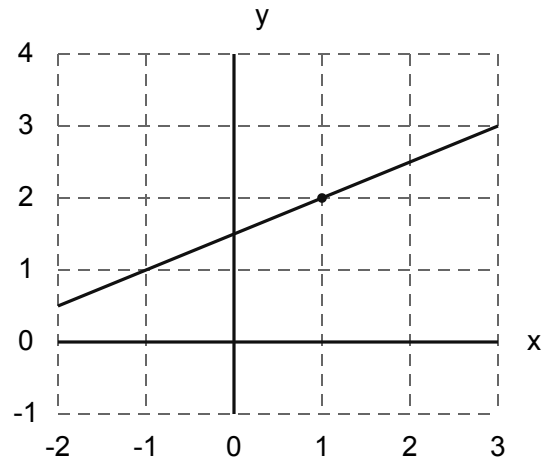
Continuity means $f(a)$ exists and equals both finite one-sided limits. A hole or changed point can be removable. Different finite side limits give a jump; unbounded behavior gives an infinite discontinuity. Open circles exclude points; solid dots include them.

WORKED EXAMPLE

Use the graph to decide whether f is continuous at $x=1$. State both one-sided limits and $f(1)$.

1. From the left, the graph approaches $y=2$. From the right, it also approaches $y=2$.
2. The solid point gives $f(1)=2$. All three conditions hold.

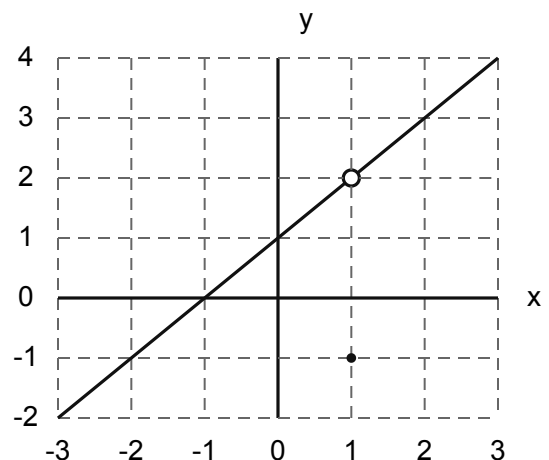
Answer: Both limits and $f(1)$ are 2; continuous at $x=1$.



PRACTICE 4 problems

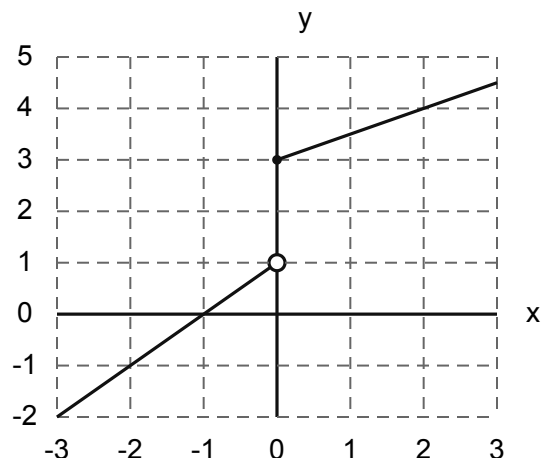
- 1** At $x=1$, give the left limit, right limit and $f(1)$. Classify continuity; if needed, name the discontinuity.

ANSWER _____



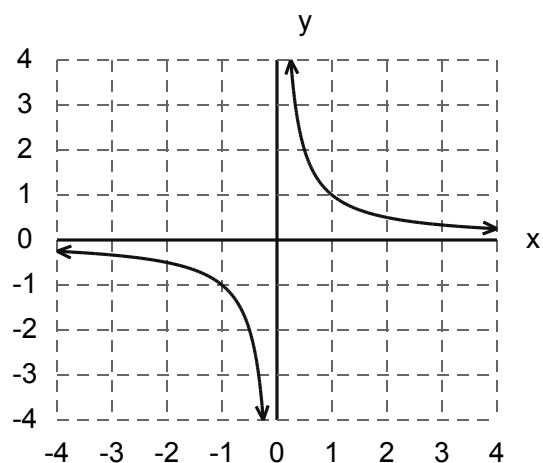
- 2** At $x=0$, give both one-sided limits and $f(0)$. Classify the discontinuity. Could changing only $f(0)$ repair it?

ANSWER _____



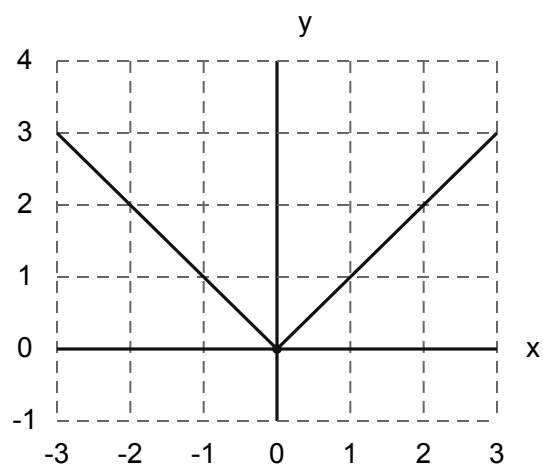
- 3** Describe the two sides near $x=0$. Is there a finite limit? Classify the discontinuity.

ANSWER _____



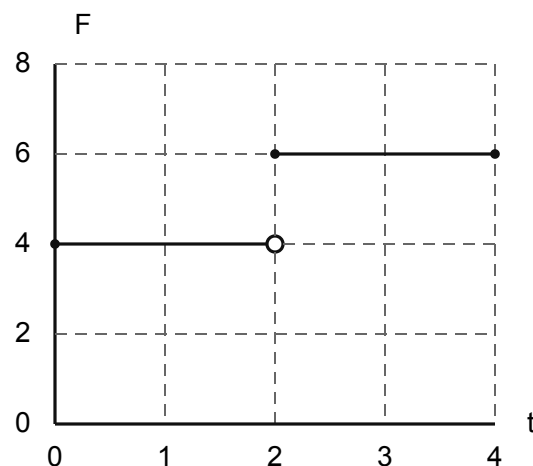
- 4** Decide whether the corner at $x=0$ is a discontinuity. Support your answer with limits and the function value.

ANSWER _____

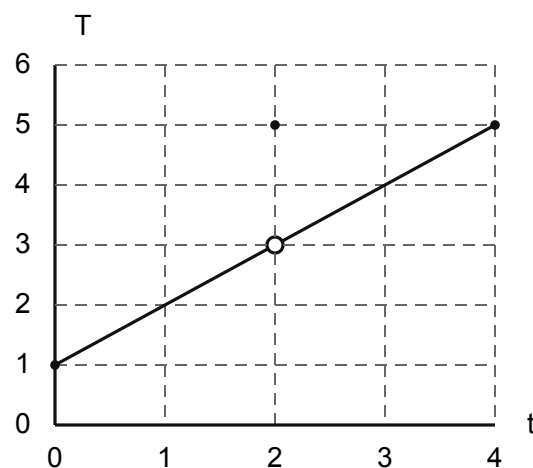


APPLY IT Show your work**1**

A parking fee $F(t)$, in dollars, is shown for $0 \leq t \leq 4$ hours. Classify the behavior at $t=2$ using the two limits and the charged fee. Can one point change remove the break?

**2**

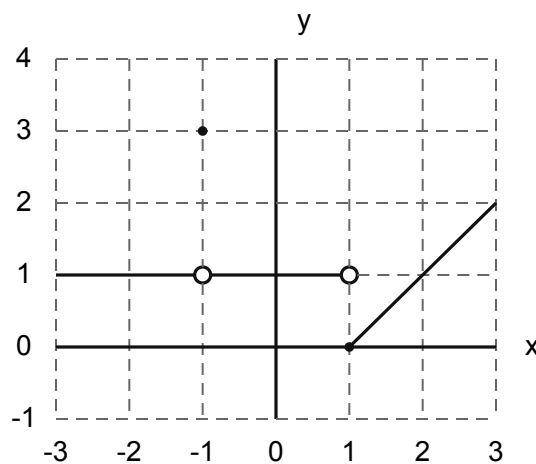
A temperature model $T(t)$, in degrees Celsius, has one faulty point reading at $t=2$ minutes. Use the graph to classify the break and give the replacement reading that restores continuity.



CHALLENGE One step up

For $x = -1, 0$ and 1 , state the left limit, right limit and $f(x)$, then classify continuity. Which break can be repaired by changing a single point value, and to what value?

WORK SPACE AND ANSWER



PRACTICE 1

Limits 2 and 2; $f(1)=-1$. Removable discontinuity.

PRACTICE 2

Left limit 1, right limit 3; $f(0)=3$. Jump; changing one point cannot make the limits agree.

PRACTICE 3

Left tends to negative infinity; right to positive infinity. No finite limit; infinite discontinuity.

PRACTICE 4

Both limits and $f(0)$ are 0. Continuous: a corner alone is not a discontinuity.

APPLY IT 1

Left limit \$4; right limit and $F(2)$ are \$6. Jump; no single point change removes it.
The fee approaches different values on the two sides of 2 hours.

APPLY IT 2

Removable discontinuity. Replace $T(2)=5$ with $T(2)=3$ degrees Celsius.
Both sides approach 3 degrees, but the plotted point value is 5 degrees.

CHALLENGE

At -1: 1,1,3; removable, set $f(-1)=1$. At 0: 1,1,1; continuous. At 1: 1,0,0; jump, not removable.

Accept equivalent limit notation and explanations. Infinite behavior is not a finite limit. A discontinuity may be removable even when the function has a defined value. Only specified interior points are assessed; viewing-window edges are not additional discontinuities.