

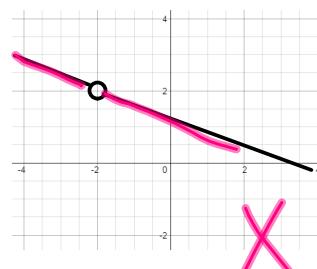
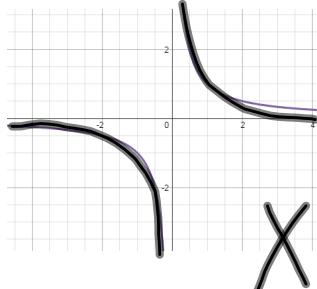
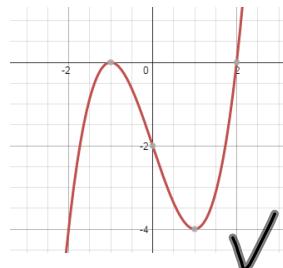
12.3 Continuity

Essential Question

How do I determine if a function is continuous at a specific value?

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A function is continuous at $x = c$ if...

1. $f(c)$ is defined.

2. $\lim_{x \rightarrow c} f(x)$ exists.

3. $\lim_{x \rightarrow c} f(x) = f(c)$

Non examples

1. $x=2$ undefined discontinuous @ $x=2$

2. $x=-1$ DNE discontin. @ $x=-1$

3. $x=-2$ discontin. @ $x=-2$

$f(-2) = -1$

$\lim_{x \rightarrow -2} f(x) = 4$

12.3 Continuity

Essential Question

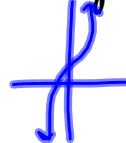
How do I determine if a function is continuous at a specific value?

Example. Is $f(x) = x^3 + 1$ continuous at $x=2$?

① $f(2) = 2^3 + 1 = 9$ Yes

② $\lim_{x \rightarrow 2} f(x) = 2^3 + 1 = 9$

③ $9 = 9 \checkmark$



All polynomials, sine, cosine, and radical functions are continuous in their domain.



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Essential Question: How do I determine if a function is continuous at a specific value?

Types of Discontinuity

1. Removable discontinuity (hole)

Cancel out a factor



2. Vertical asymptote

bottom = 0

3. Breaks/jumps

piecewise (mostly)

12.3 Continuity

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Example. Is $f(x) = \frac{x^2 - x - 6}{x^2 - 2x - 3}$ continuous at $x=3$? **NO**

$$\textcircled{1} \quad f(3) = \frac{9-3-6}{9-6-3} = \frac{0}{0}$$
$$\frac{(x-3)(x+2)}{(x-3)(x+1)}$$

removable discontinuity

hole @ $x=3$

VA @ $x=-1$

12.3 Continuity

Essential Question: How do I determine if a function is continuous at a specific value?

Example. Is $f(x) = \begin{cases} x-2 & x > 3 \\ -2x+2 & x \leq 3 \end{cases}$ continuous at $x=3$?

✓ ① $f(3) = -2(3)+2 = -4$

✗ ② $\lim_{x \rightarrow 3} f(x)$ DNE
 $\text{RS } 3-2 = 1$
 $\text{LS } -4$

Example. Is $f(x) = \begin{cases} 2x-1 & x > 5 \\ x^2-16 & x \leq 5 \end{cases}$ continuous at $x=5$?

Yes

✓ ① $f(5) = 5^2-16 = 9$

✓ ② $\lim_{x \rightarrow 5} f(x) = 9$

LS 9
 $\text{RS } 2(5)-1 = 9$

③ $9 = 9 \vee \therefore$