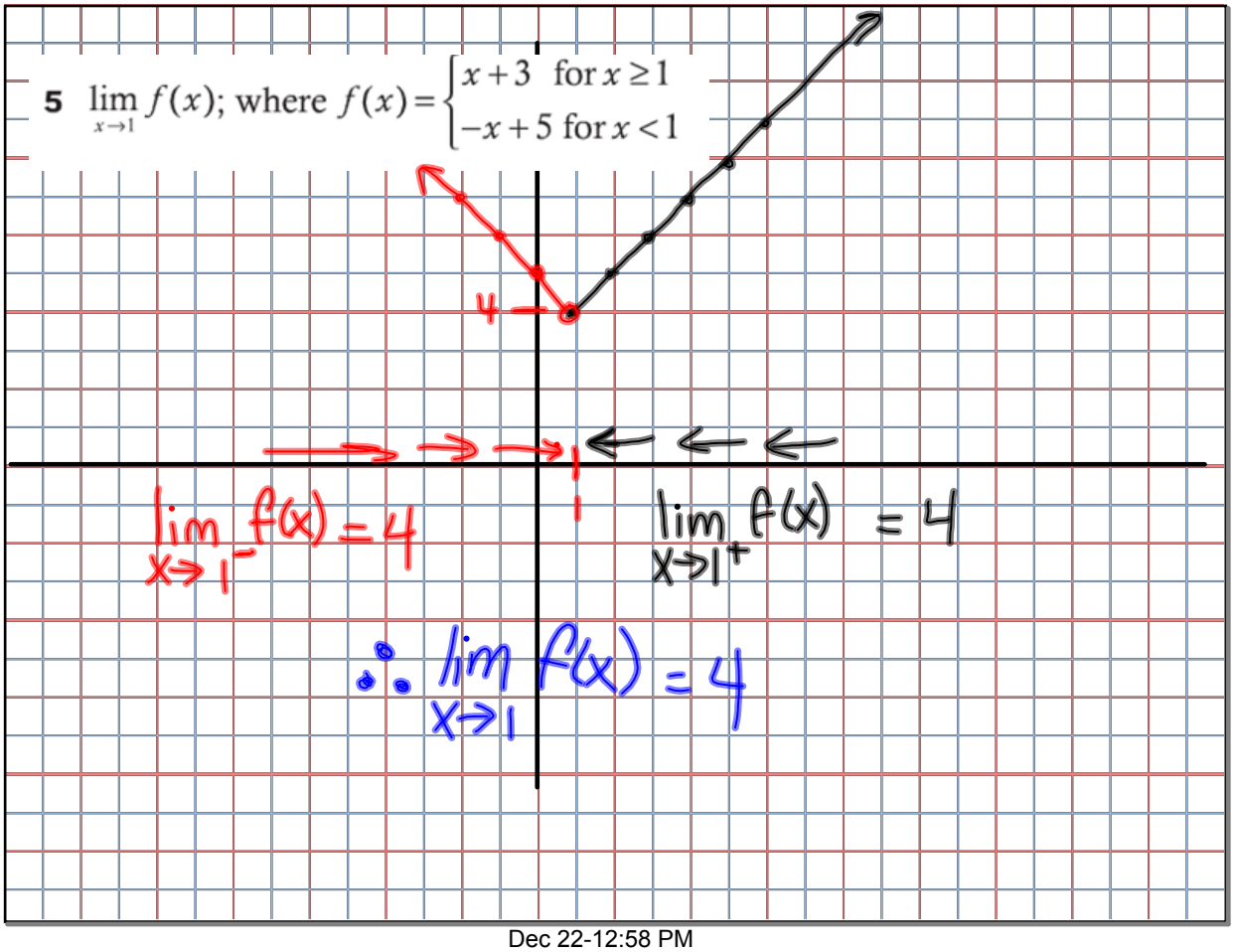
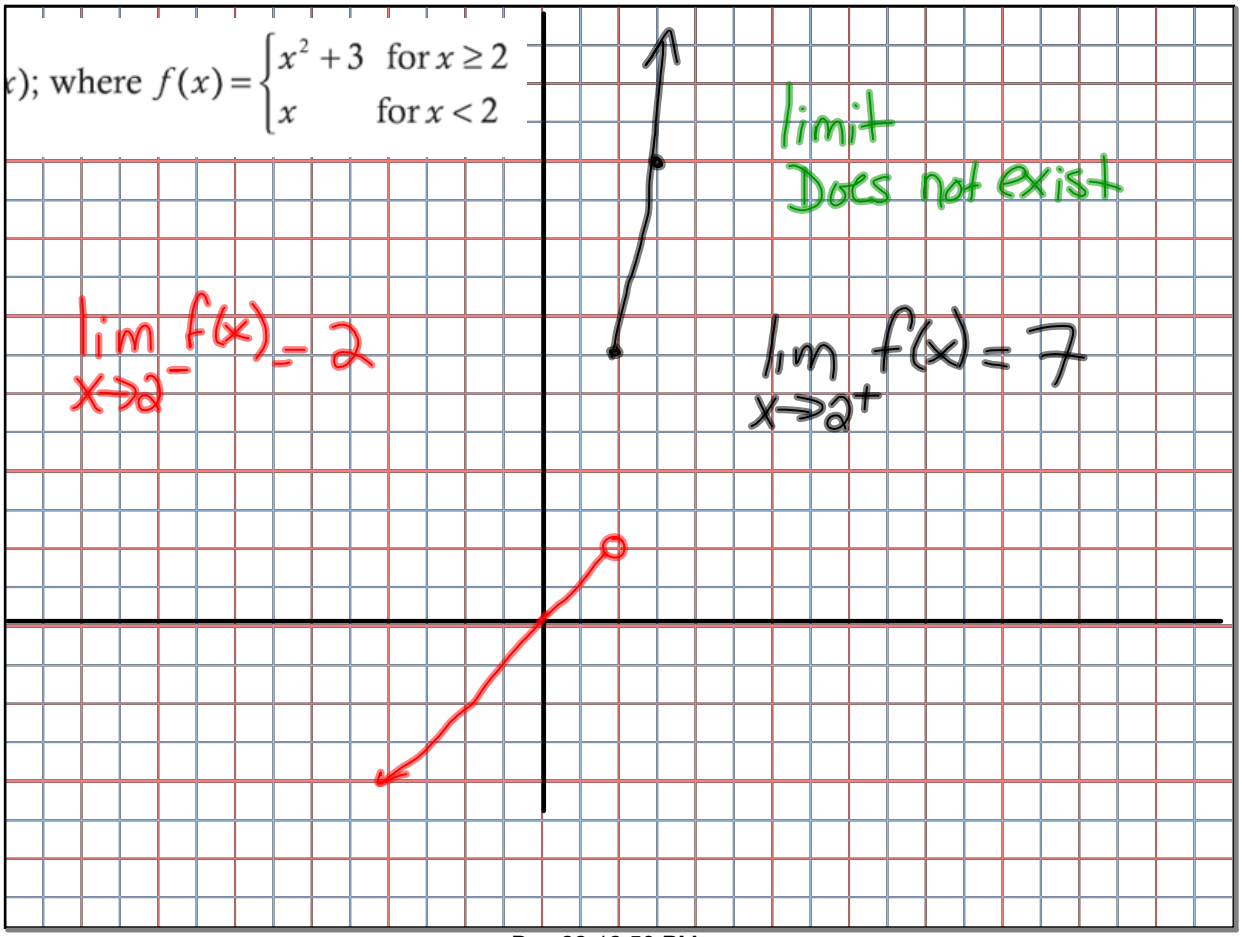


Dec 22-12:58 PM

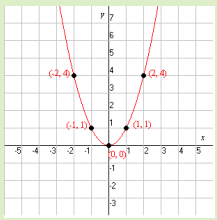


Dec 22-12:58 PM

Use a GDC to examine each function graphically and numerically.
Find the limit or state that it does not exist.

a $\lim_{x\to 2} x^3$ **b** $\lim_{x\to 1} \frac{x^3-1}{x-1}$ **c** $\lim_{x\to 0} f(x)$; where $f(x)=\begin{cases}1 & \text{for } x\geq 0\\ -1 & \text{for } x<0\end{cases}$

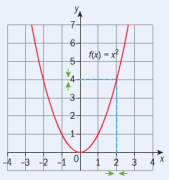
a.)



Answers

a $\lim_{x\to 2} x^3$

Plot the graph of $f(x) = x^3$ using a GDC, and look at the values of f(x) as x approaches 2 from the right and from the left.



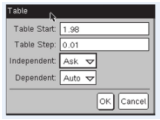
Graphically, f(x) approaches 4 as x approaches 2:
Numerically, as x becomes close to 2 from either side, f(x) becomes close to 4.

→ 2 ←

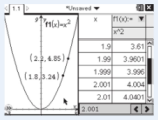
x	1.8	1.9	1.99	1.999	2.001	2.01	2.1	2.2
f1(x)	3.24	3.61	3.960	3.996	4.004	4.040	4.41	4.84

→ 4 ←

To build the table above using a GDC, enter $f1(x) = x^2$. Then set the independent variables to 'Ask'. Enter the values for x.



The graph and table are shown on the same screen.



For $f(x) = x^2$ we can substitute and find that $\lim_{x\to 2} x^2 = 2^2 = 4$

Feb 24-10:13 AM

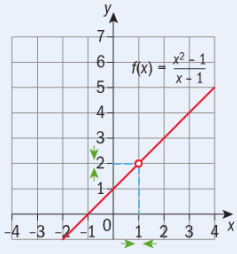
Use a GDC to examine each function graphically and numerically.
Find the limit or state that it does not exist.

a $\lim_{x\to 2} x^3$ **b** $\lim_{x\to 1} \frac{x^3-1}{x-1}$ **c** $\lim_{x\to 0} f(x)$; where $f(x)=\begin{cases}1 & \text{for } x\geq 0\\ -1 & \text{for } x<0\end{cases}$

b.)

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

$\lim_{x\to 1^+} f(x) = 2$



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

Since division by zero is not defined, $f(x)=\frac{x^2-1}{x-1}$ is undefined when $x - 1 = 0$ or $x = 1$. Therefore there is a **discontinuity** *in the graph when $x = 1$. Notice that $f(x)=\frac{x^2-1}{x-1}=\frac{(x+1)(x-1)}{x-1}=x+1$, when $x\neq 1$*

Even though $f(x)=\frac{x^2-1}{x-1}$ is undefined when $x = 1$, the limit exists since as x becomes close to 1 from either side, f (x) becomes close to 2.

→ 1 ←

x	0.8	0.9	0.99	0.999	1.001	1.01	1.1	1.2
f(x)	1.8	1.9	1.99	1.999	2.001	2.01	2.1	2.2

→ 2 ←

Note that $\lim_{x\to 1}\frac{x^2-1}{x-1}=\lim_{x\to 1}\frac{(x+1)(x-1)}{x-1}$

$=\lim_{x\to 1}(x+1)=1+1=2$

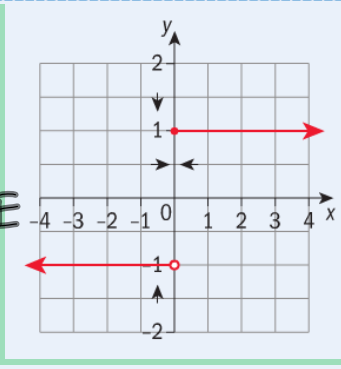
Dec 21-10:59 AM

Use a GDC to examine each function graphically and numerically.
Find the limit or state that it does not exist.

a $\lim_{x \to 2} x^2$ **b** $\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$ **c** $\lim_{x \to 0} f(x)$; where $f(x) = \begin{cases} 1 & \text{for } x \geq 0 \\ -1 & \text{for } x < 0 \end{cases}$

C.)

$\lim_{x \to 0} f(x) = DNE$



$\lim_{x \to 0^+} f(x) = 1$

$\lim_{x \to 0^-} f(x) = -1$

f(x) does not approach the same value as x approaches 0 from the left and right:

$\rightarrow 0 \leftarrow$

x	−0.2	−0.1	−0.01	−0.001	0.001	0.01	0.1	0.2
f(x)	−1	−1	−1	−1	1	1	1	1

Note that f(0) = 1, but $\lim_{x \to 0} f(x)$ *does not exist.*

This is because f (x) is close to 1 for values of x to the right of x = 0 and f(x) is close to −1 for values of x to the left of x = 0.

Dec 21-10:59 AM

Exercise 7B

Use a GDC to examine each function graphically and numerically. Find the limit or state that it does not exist.

1 $\lim_{x \to 3} (x^2 + 1)$

2 $\lim_{x \to 0} \frac{x^3 - 4x^2 + x}{x}$

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

4 $\lim_{x \to 4} \frac{1}{x - 4}$

5 $\lim_{x \to 1} f(x)$; where $f(x) = \begin{cases} x + 3 & \text{for } x \geq 1 \\ -x + 5 & \text{for } x < 1 \end{cases}$

6 $\lim_{x \to 2} f(x)$; where $f(x) = \begin{cases} x^2 + 3 & \text{for } x \geq 2 \\ x & \text{for } x < 2 \end{cases}$

Feb 24-10:13 AM