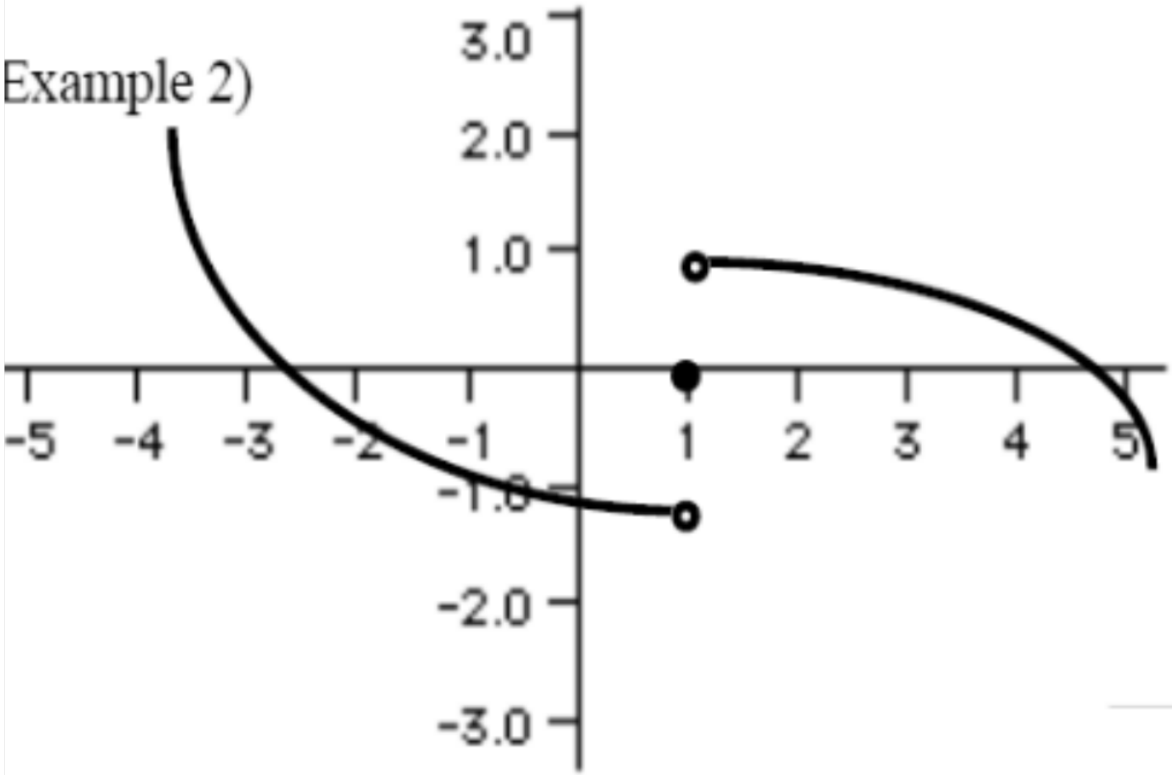
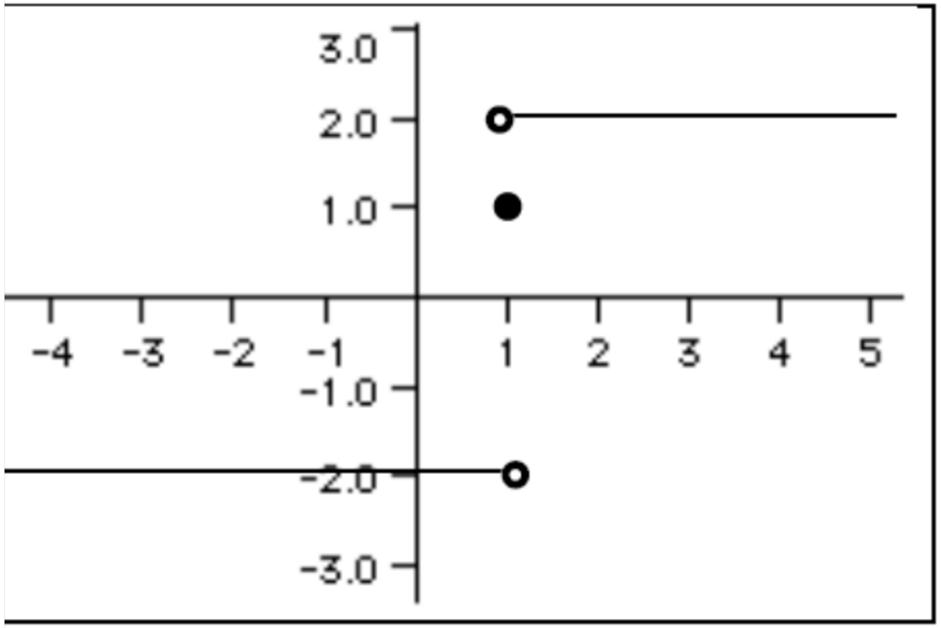
Warmup

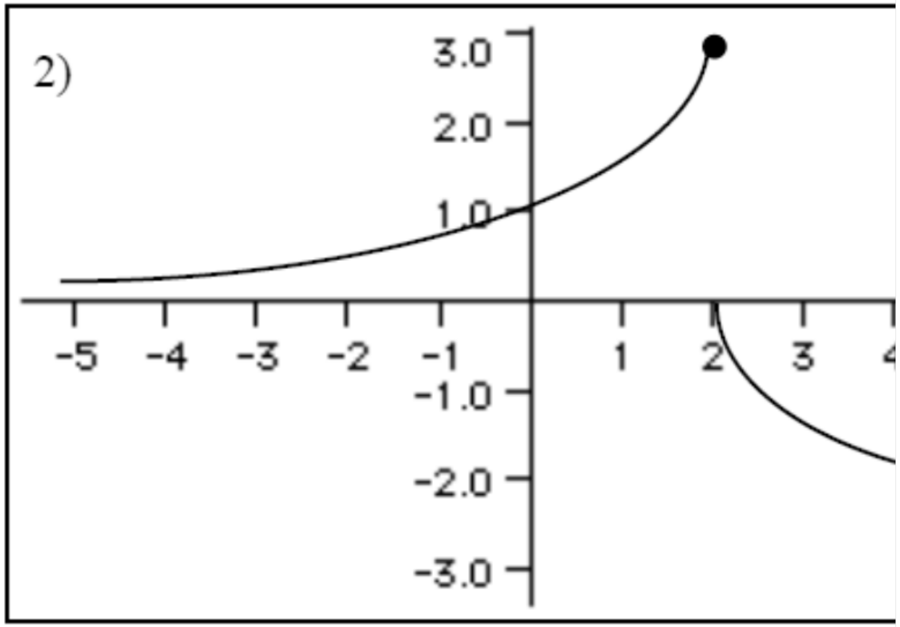


Explain why the limit does not exist.

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

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



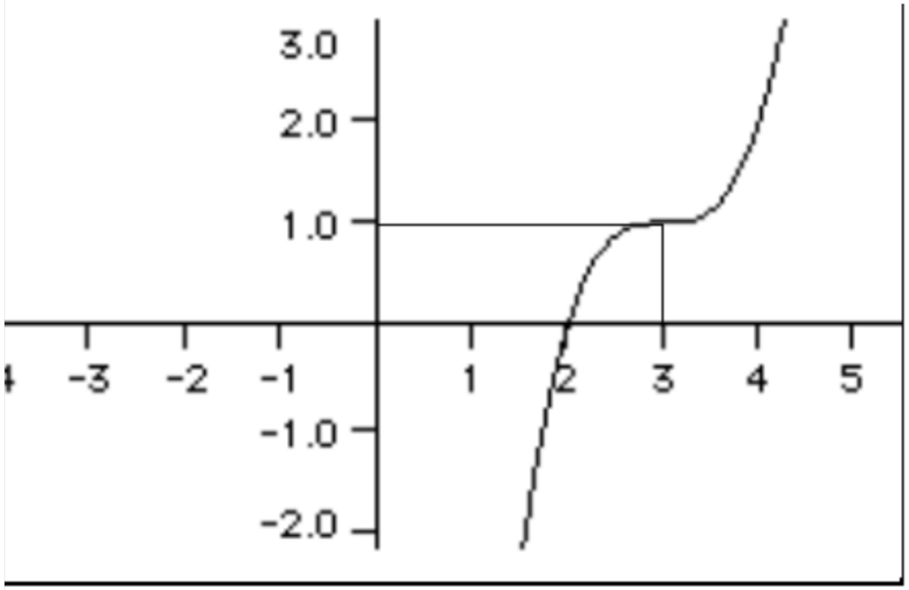


$\underset{1^-}{\text{n}} f(x)$ b) $\lim_{x\to1^+} f(x)$ c) $\lim_{x\to1} f(x)$

1) e) $\lim_{x\to-\infty} f(x)$ f) $\lim_{x\to\infty} f(x)$

a) $\lim_{x\to2^-} f(x)$ b) $\lim_{x\to2^+} f(x)$ c) $\lim_{x\to2} f(x)$

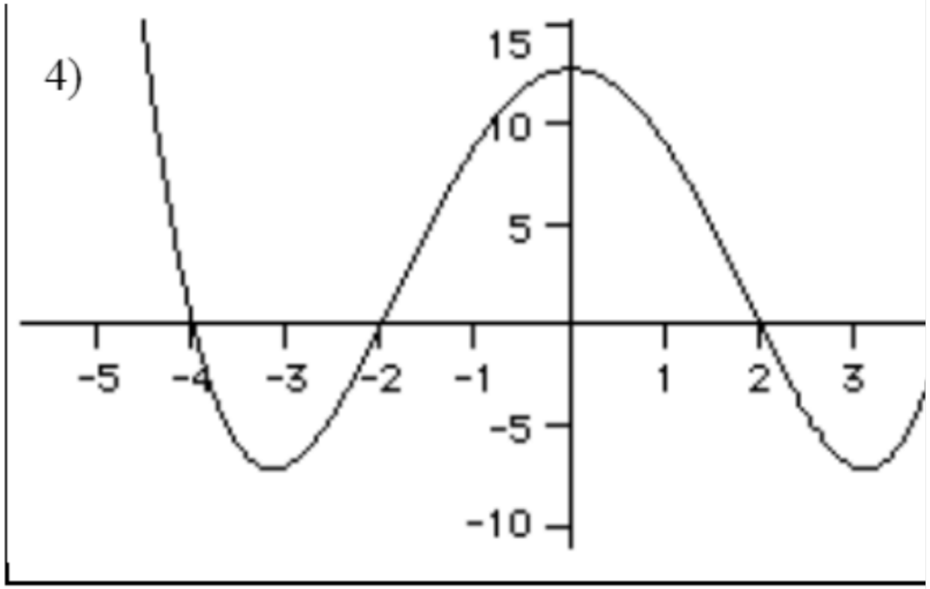
d) $f(2)$ e) $\lim_{x\to-\infty} f(x)$ f) $\lim_{x\to\infty} f(x)$



(x) b) $\lim_{x \to 3^+} f(x)$ c) $\lim_{x \to 3} f(x)$

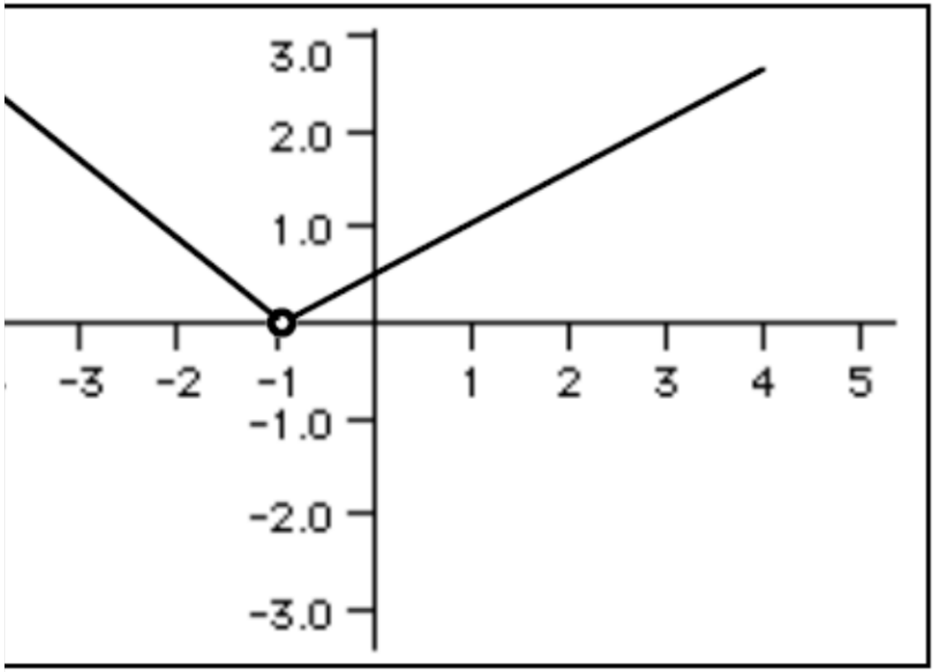
e) $\lim_{x \to -\infty} f(x)$ f) $\lim_{x \to \infty} f(x)$

4)

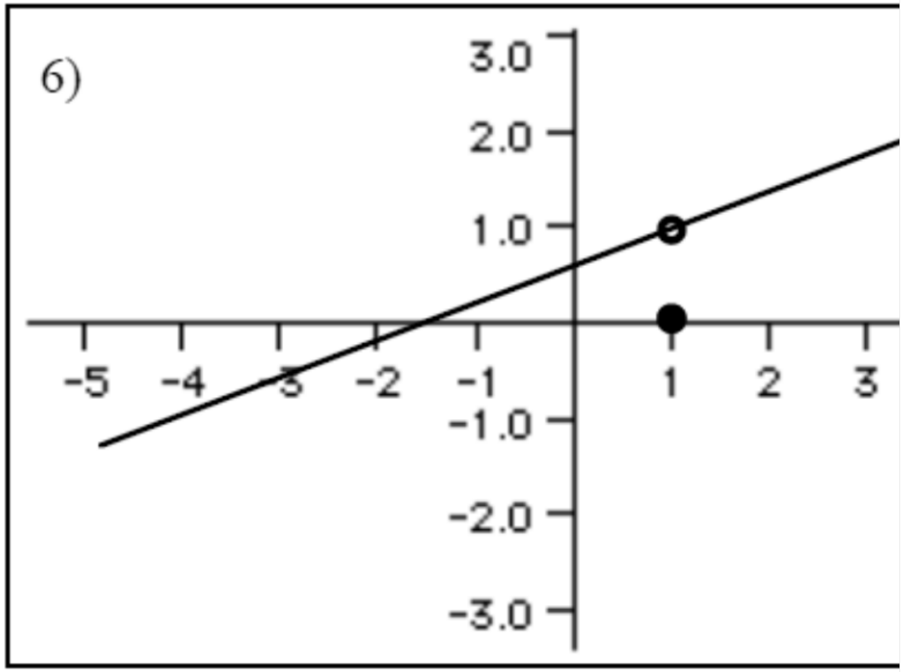


a) $\lim_{x \to 0^-} f(x)$ b) $\lim_{x \to 0^+} f(x)$ c) $\lim_{x \to 0} f(x)$

d) $f(0)$ e) $\lim_{x \to -\infty} f(x)$ f) $\lim_{x \to \infty} f(x)$



6)

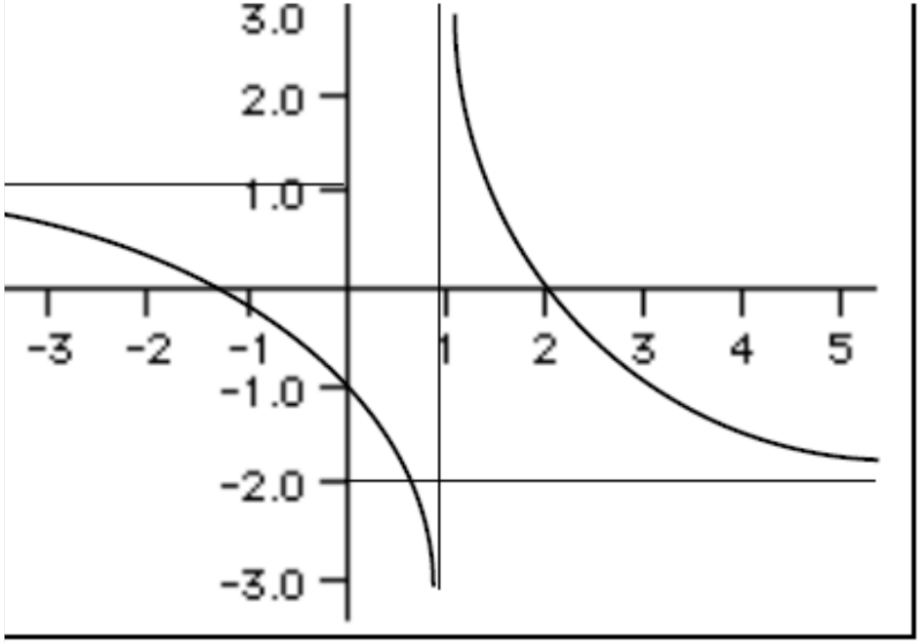


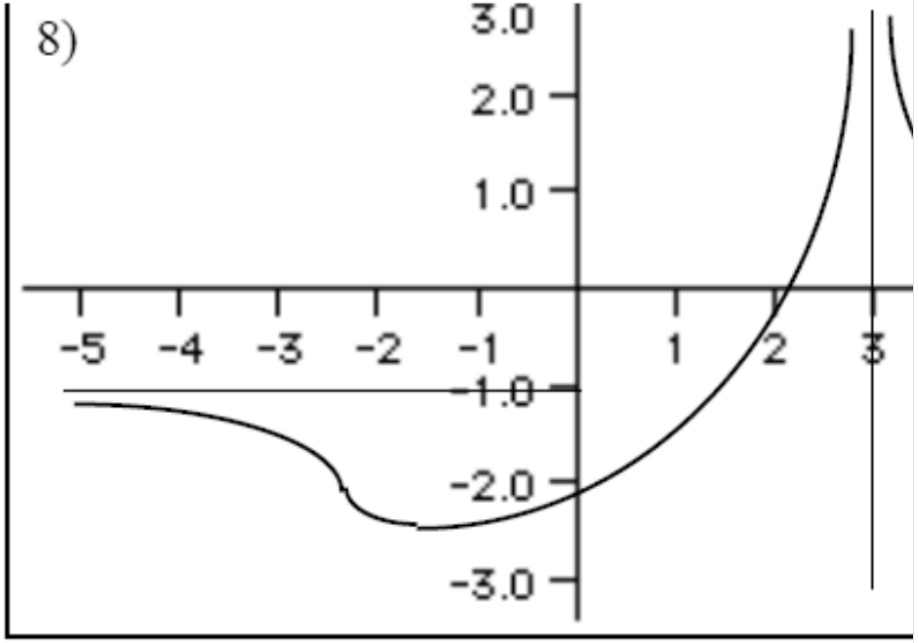
(x) b) $\lim_{x\to -1^+} f(x)$ c) $\lim_{x\to -1} f(x)$

e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f(x)$

a) $\lim_{x\to 1^-} f(x)$ b) $\lim_{x\to 1^+} f(x)$ c) $\lim_{x\to 1}$

d) $f(1)$ e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty}$



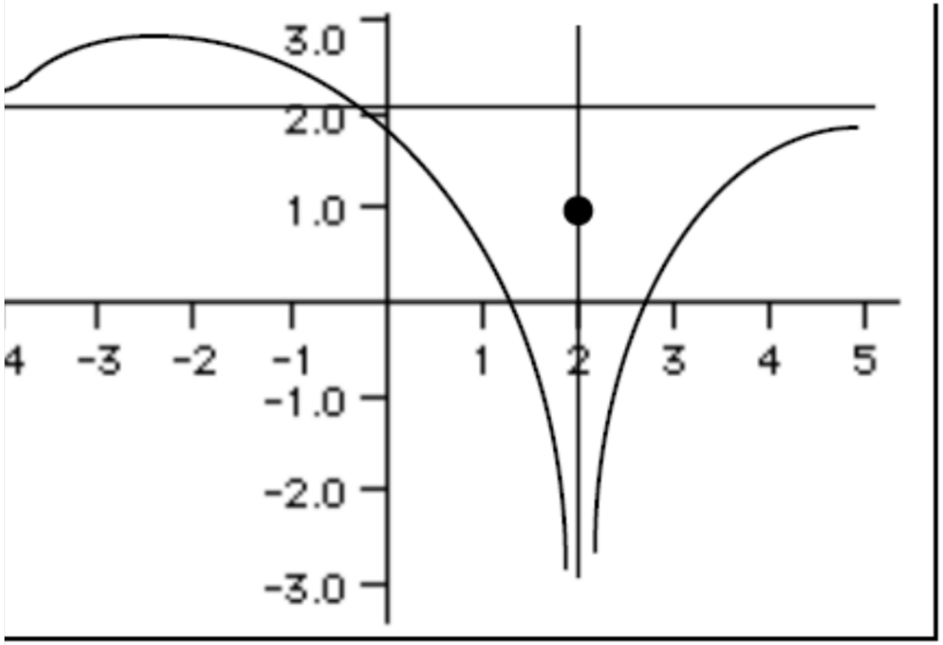


(x) b) $\lim_{x\to 1^+} f(x)$ c) $\lim_{x\to 1} f(x)$

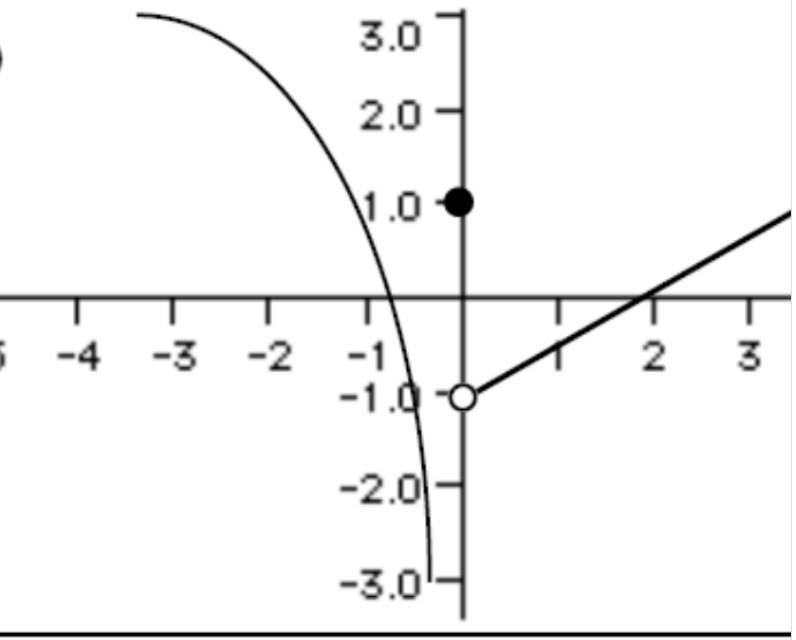
e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f(x)$

a) $\lim_{x\to 3^-} f(x)$ b) $\lim_{x\to 3^+} f(x)$ c) $\lim_{x\to 3} f(x$

d) $f(3)$ e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f($



10)

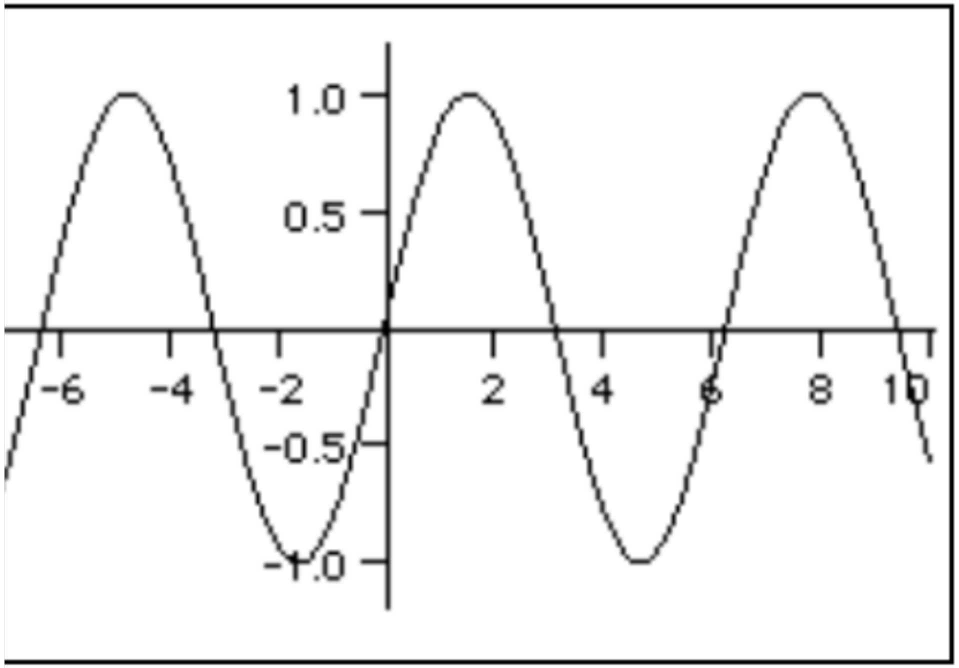


$f(x)$ b) $\lim_{x\to 2^+} f(x)$ c) $\lim_{x\to 2} f(x)$

) e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f(x)$

a) $\lim_{x\to 0^-} f(x)$ b) $\lim_{x\to 0^+} f(x)$ c) $\lim_{x\to 0} f(x$

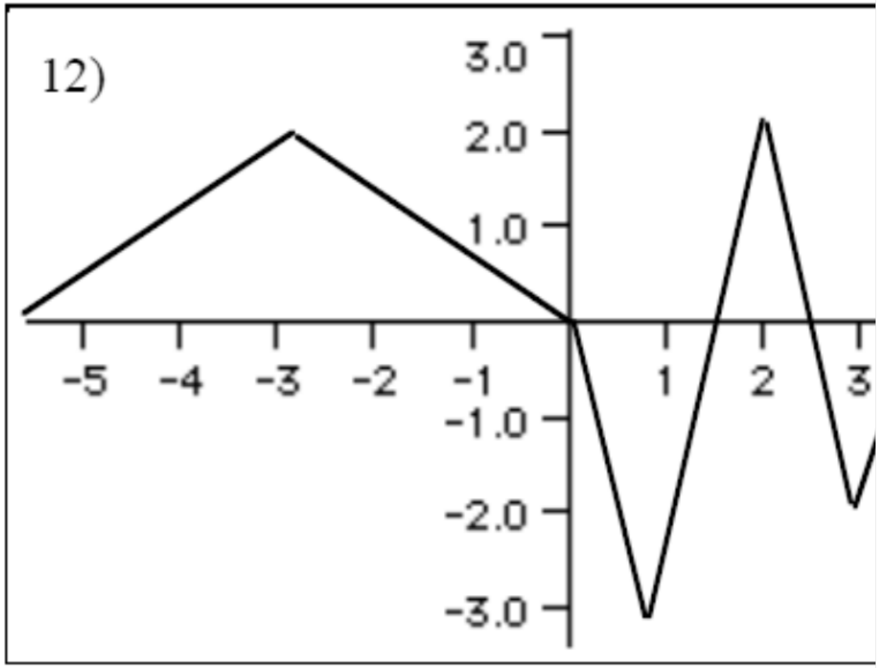
d) $f(0)$ e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f($



(x) b) $\lim_{x\to 0^+} f(x)$ c) $\lim_{x\to 0} f(x)$

e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f(x)$

12)



a) $\lim_{x\to 0^-} f(x)$ b) $\lim_{x\to 0^+} f(x)$ c) $\lim_{x\to 0} f($

d) $f(0)$ e) $\lim_{x\to -\infty} f(x)$ f) $\lim_{x\to \infty} f$

Strategies for Finding Limits

-Factor and Cancel

-Multiply by Conjugate

-Get Common Denominator

Factor and Cancel

Evaluate $\lim_{x \to 5} \frac{x^2 - 25}{x - 5}$.

Try plugging 5 into *x* — you should *always* try substitution first.

You get $\frac{0}{0}$ — no good, on to plan B.

Factor:

$$\lim_{x \to 5} \frac{x^2 - 25}{x - 5}$$

$$= \lim_{x \to 5} \frac{(x-5)(x+5)}{x-5}$$

3. Cancel the (*x* – 5) from the numerator and denomina

$$= \lim_{x \to 5} (x+5)$$

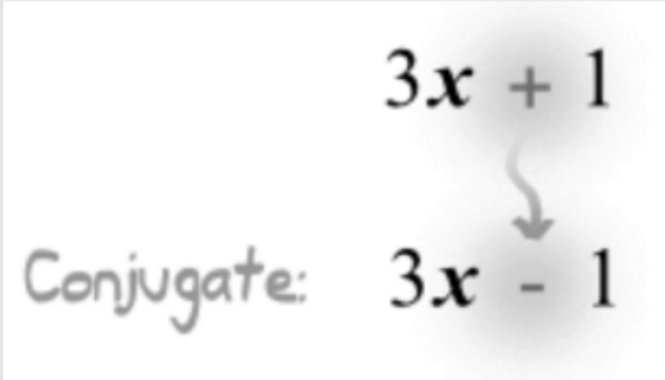
4. Now substitution will work.

You try!

$$\lim_{x \to 1} \frac{x^2 - 1}{x - 1}$$

ıltiply by Conjugate

The conjugate is where we change
: sign in the middle of 2 terms like this:



is an example where it will help us find a limit:

$$\lim_{x \to 4} \frac{2 - \sqrt{x}}{4 - x}$$ Evaluating this at x=4 gives 0/0, which is not a good an

et's try some rearranging:

top and bottom by the conjugate of the top: $\frac{2-\sqrt{x}}{4-x} \times \frac{2+\sqrt{\ }}{2+\sqrt{\ }}$

implify top using $(a+b)(a-b)=a^2-b^2$: $\frac{2^2-(\sqrt{x})^2}{(4-x)(2+\sqrt{x})}$

Simplify top further: $\frac{(4-x)}{(4-x)(2+\sqrt{x})}$

Cancel (4−x) from top and bottom: $\frac{1}{2+\sqrt{x}}$

$$\lim_{x \to 4} \frac{2-\sqrt{x}}{4-x} = \lim_{x \to 4} \frac{1}{2+\sqrt{x}} = \frac{1}{2+\sqrt{4}} = \frac{1}{4}$$

You try!

$$\lim_{x \to 1} \frac{2 - \sqrt{3 + x}}{x - 1}$$

et Common Denominator

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

Multiply denominators 4 and

$$m_{\to -4} \frac{\frac{x}{4x} + \frac{4}{4x}}{4 + x} = \lim_{x \to -4} \frac{\frac{x+4}{4x}}{4 + x} = \lim_{x \to -4} \frac{x+4}{4x} \cdot \frac{1}{x+4}$$

$$= \lim_{x \to -4} \frac{1}{4x} = \frac{1}{4(-4)} = -\frac{1}{16}$$

You try!

Evaluate $\lim_{x \to 0} \dfrac{\dfrac{1}{x+4} - \dfrac{1}{4}}{x}$.