CALCULUS
Simple limit problems

Exercise 1: Use the graph of f given below to find the value of each quantity, if it exists. If it does not exist, explain why.

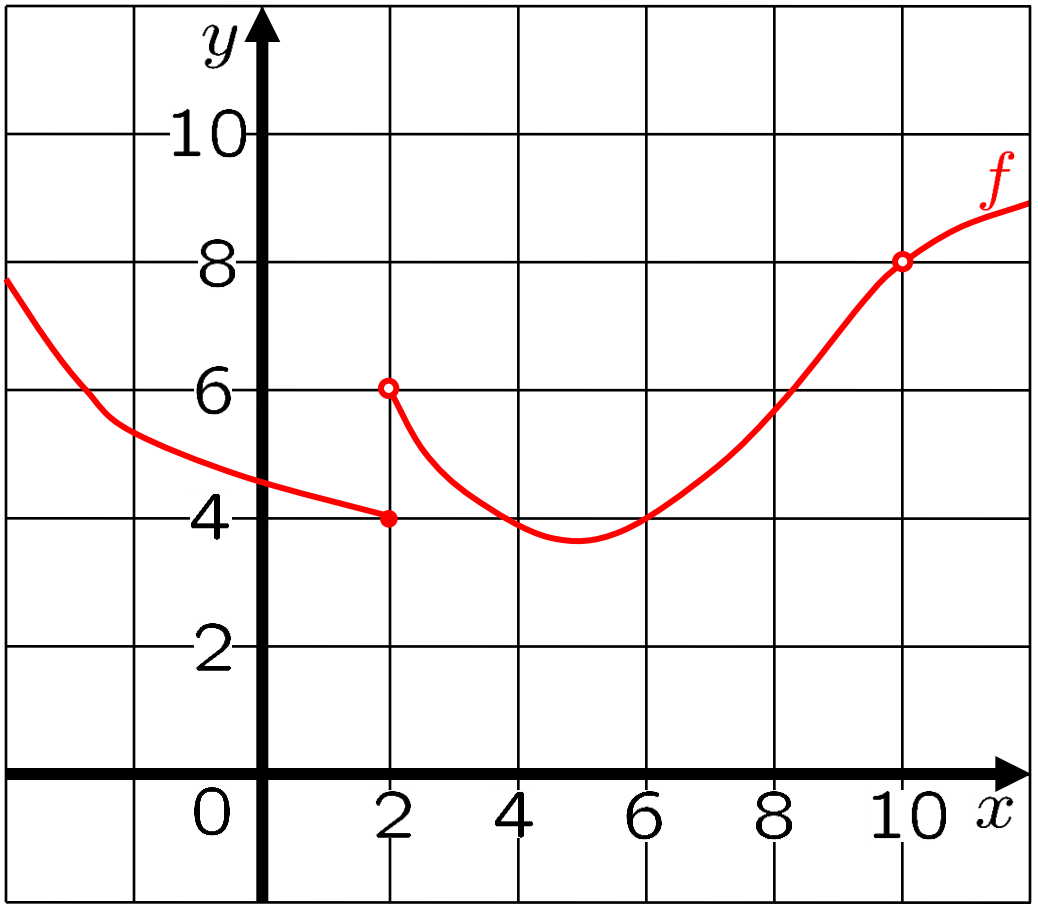
(a) $\lim_{x \to 2^-} f(x)$

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

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

(d) $\lim_{x \to 10} f(x)$

(e) $f(10)$



SKILL
lim from gph

Exercise 1: Use the graph of f given below to find the value of each quantity, if it exists. If it does not exist, explain why.

(a) $\lim_{x \to 2^-} f(x) = 4$

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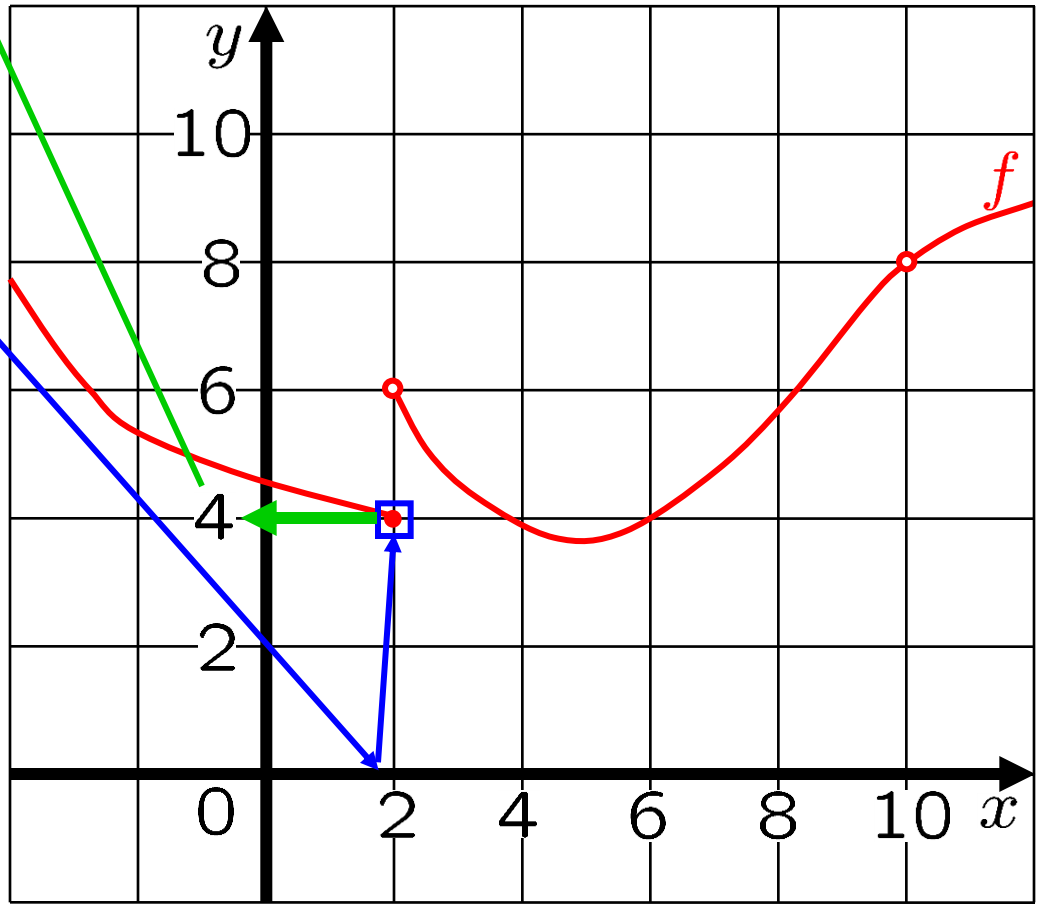

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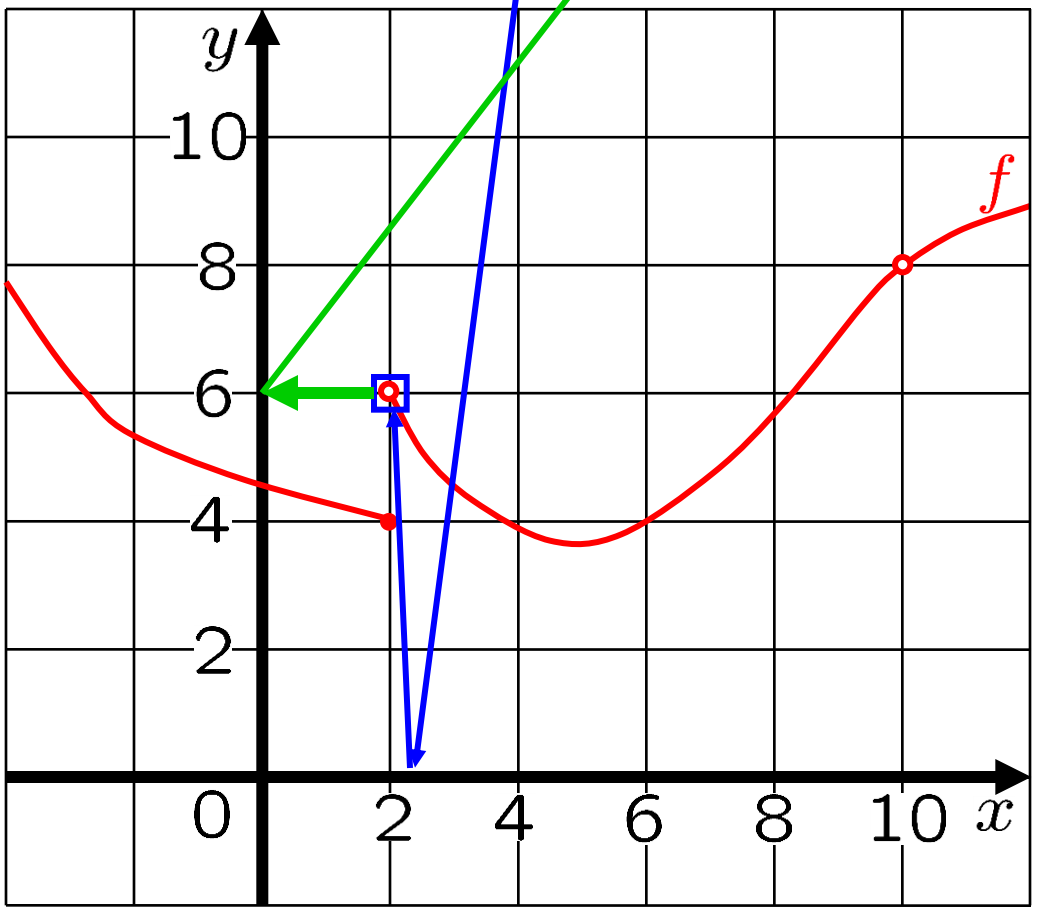

SKILL
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§2.3

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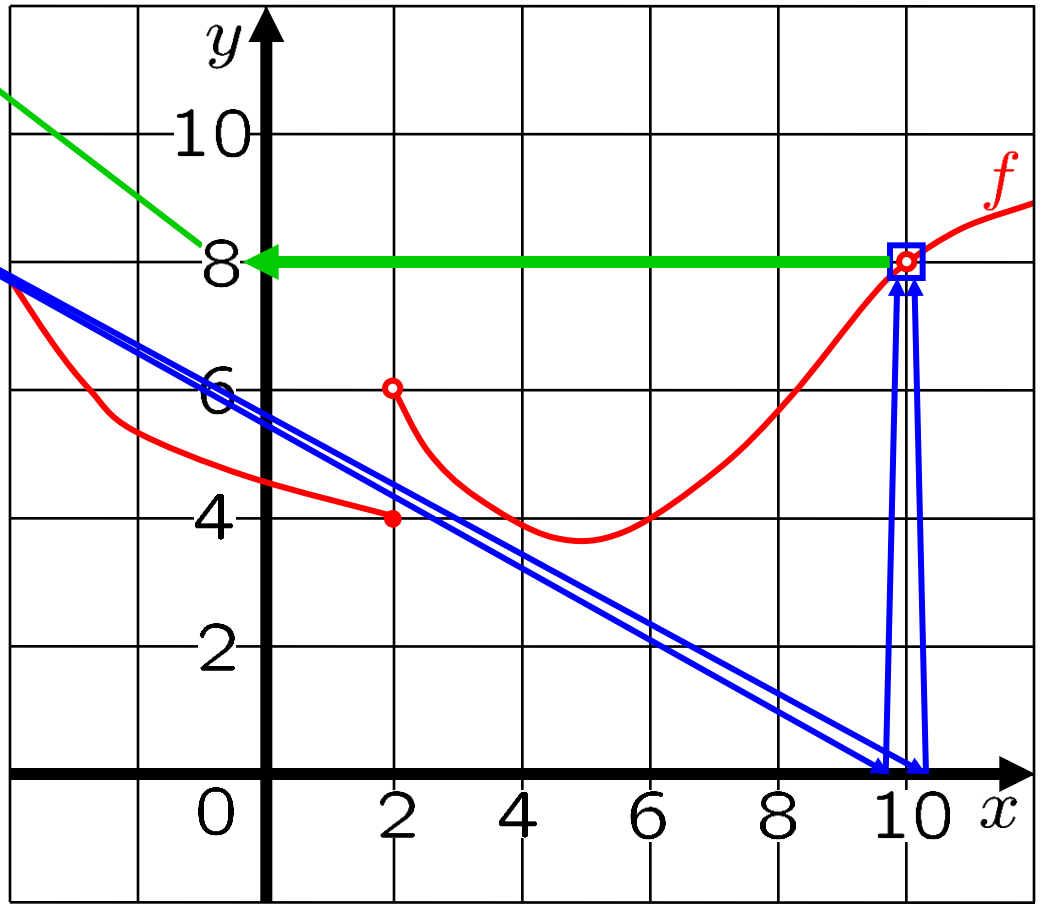
(d) $\lim_{x \to 10} f(x) = 8$

(e) $f(10)$



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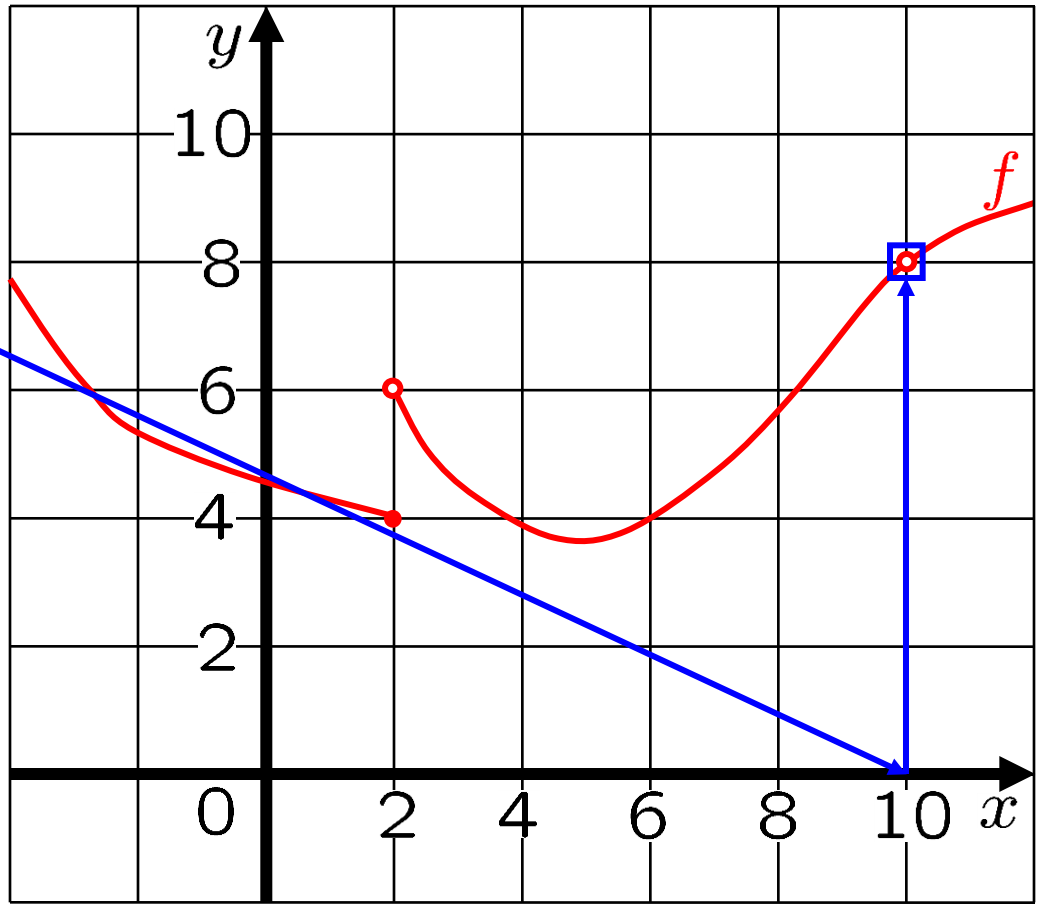

SKILL
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Exercise 2: Let H be the function whose graph is shown below. Find the following quantities:

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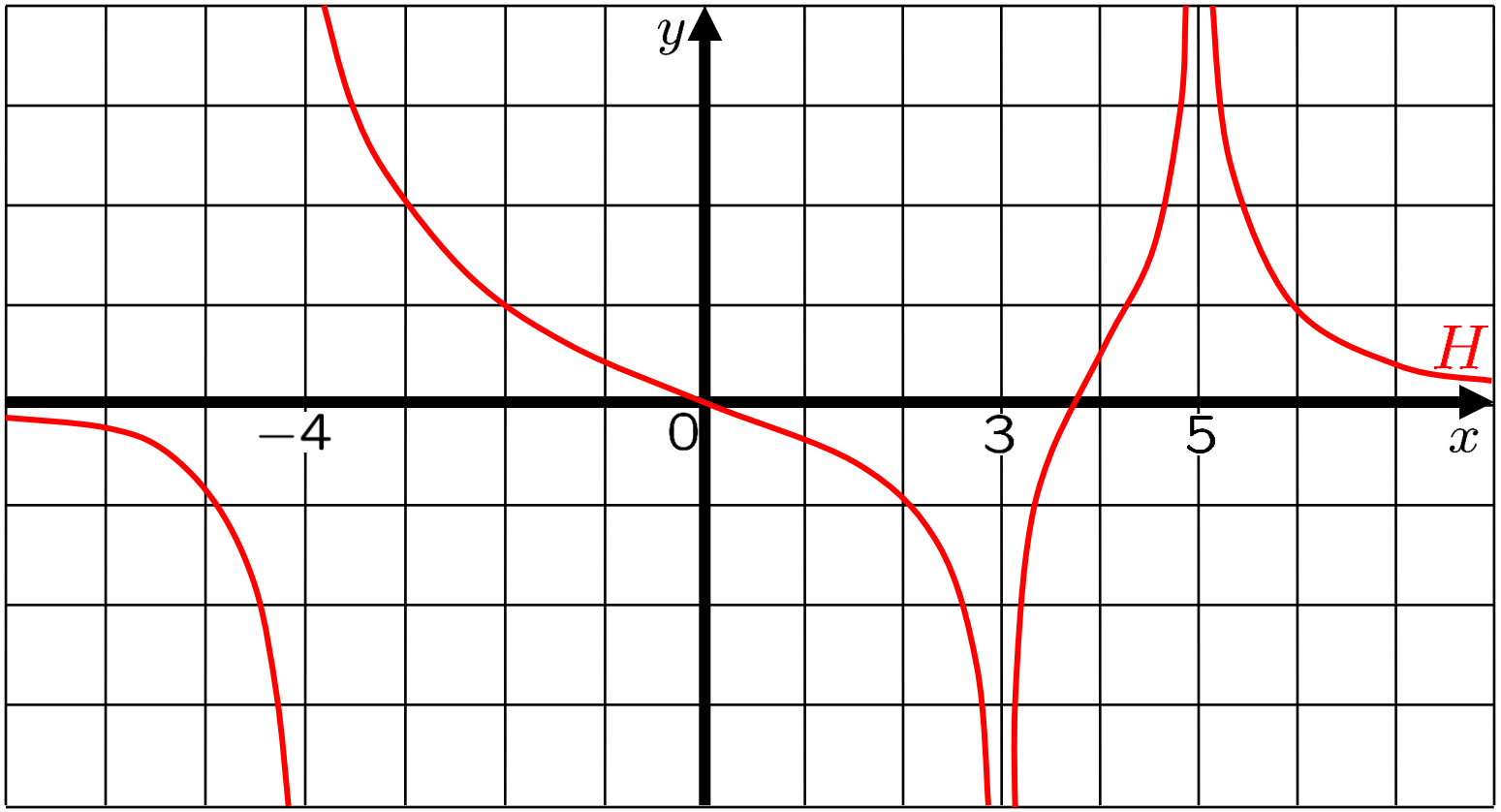
(e) The equations of the vertical asymptotes.



SKILL
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Exercise 2: Let H be the function whose graph is shown below. Find the following quantities:

(a) $\lim_{x \to 3} H(x) = -\infty$

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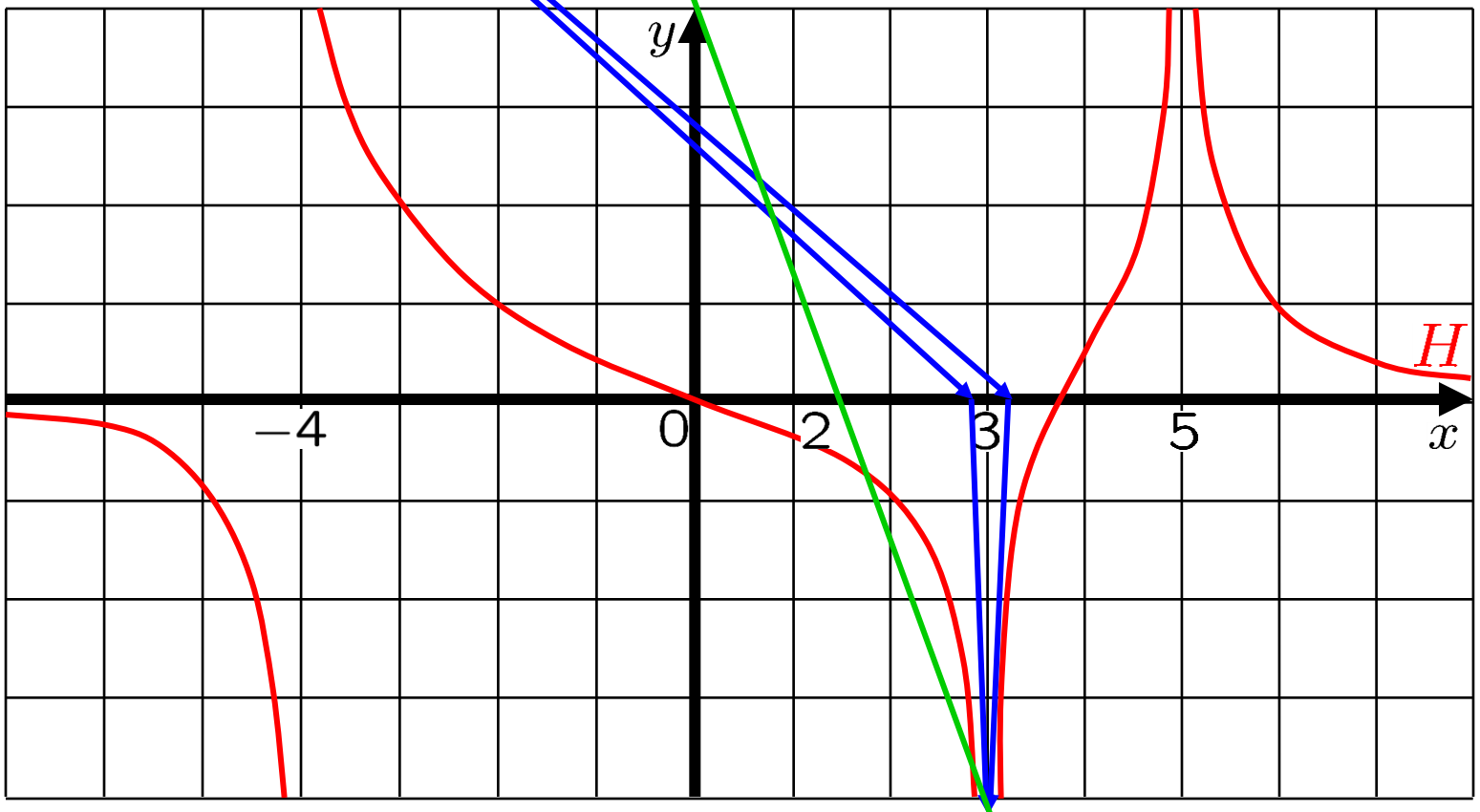

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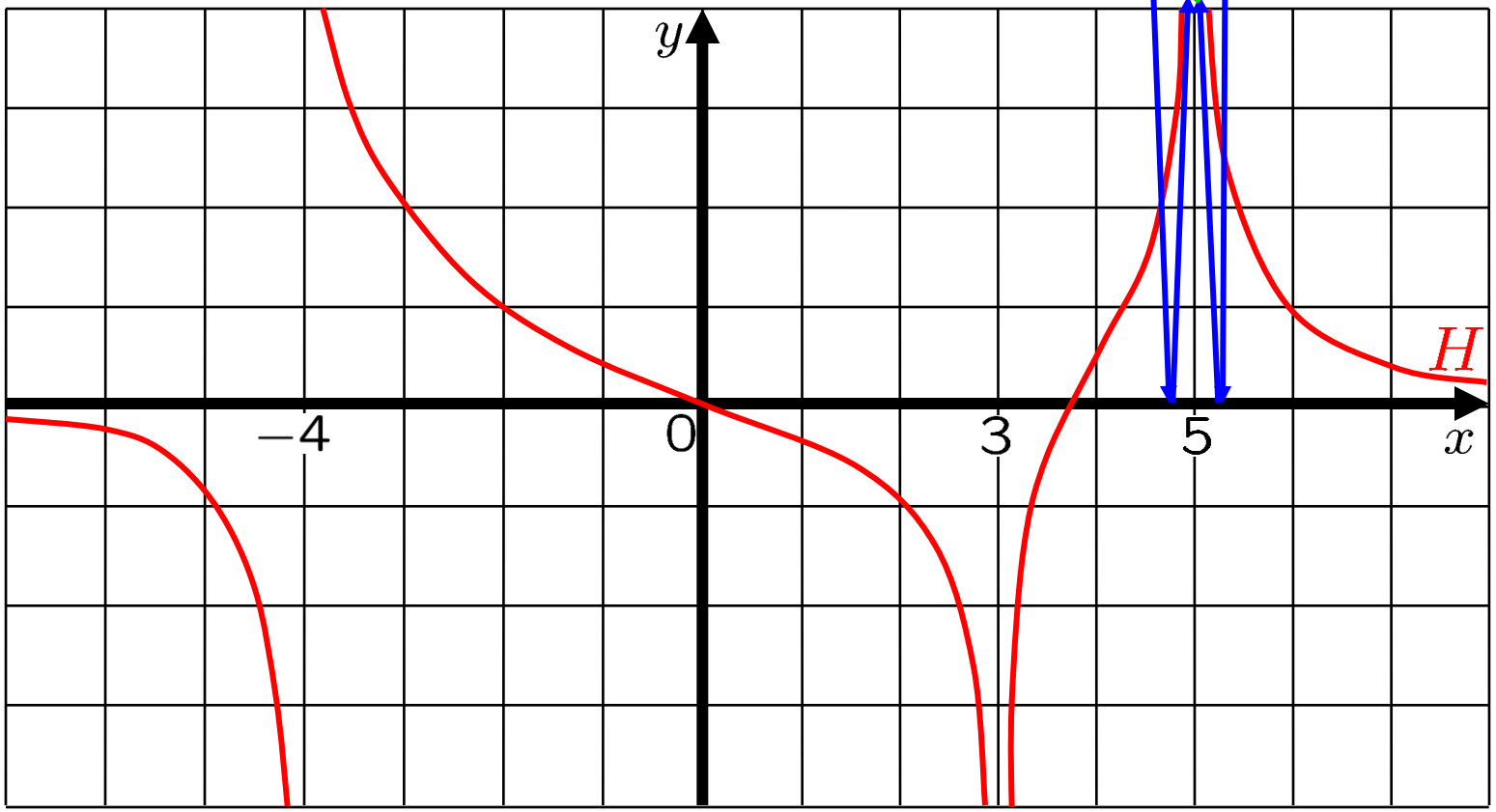

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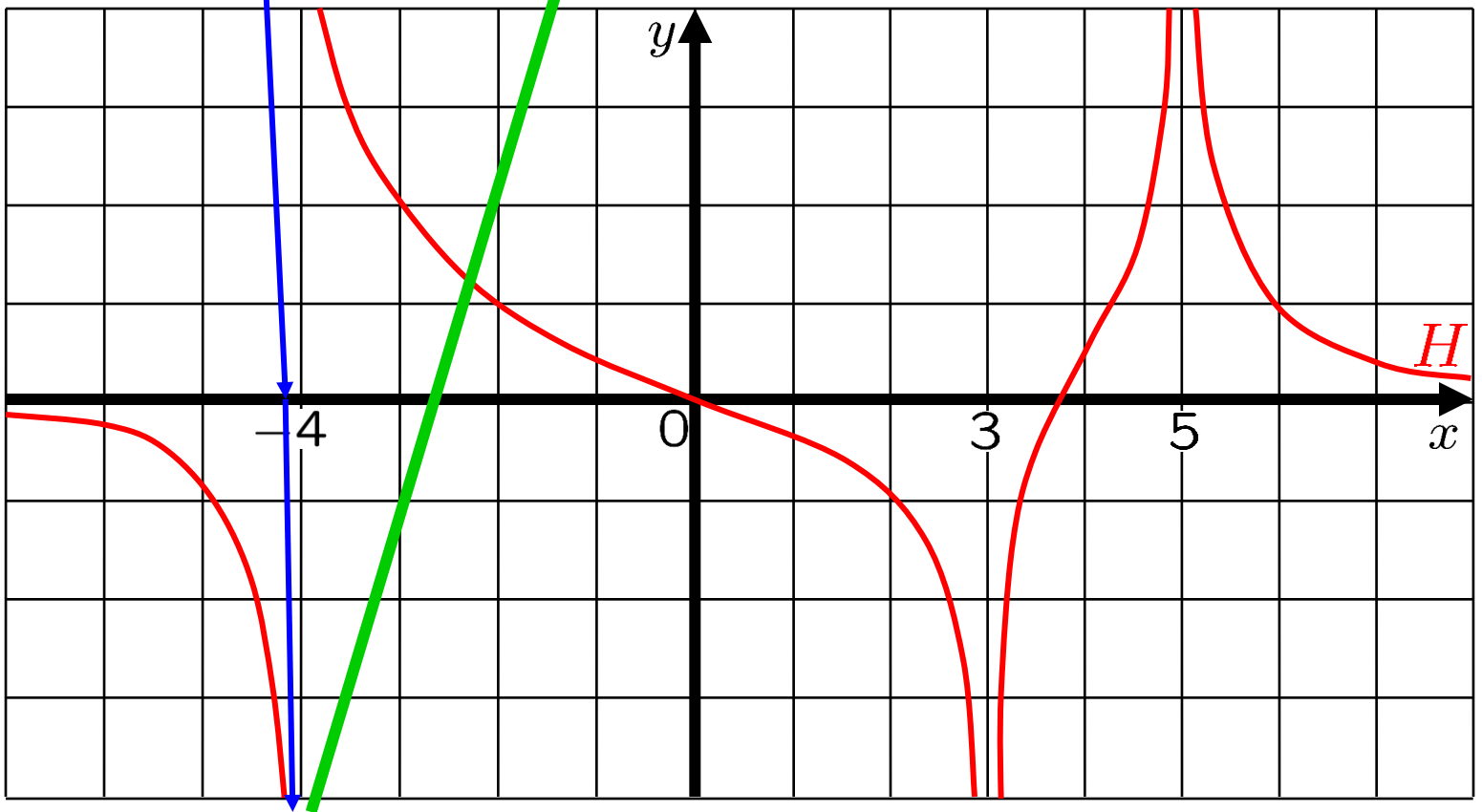

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$\lim_{x \to -4} R(x)$ DNE

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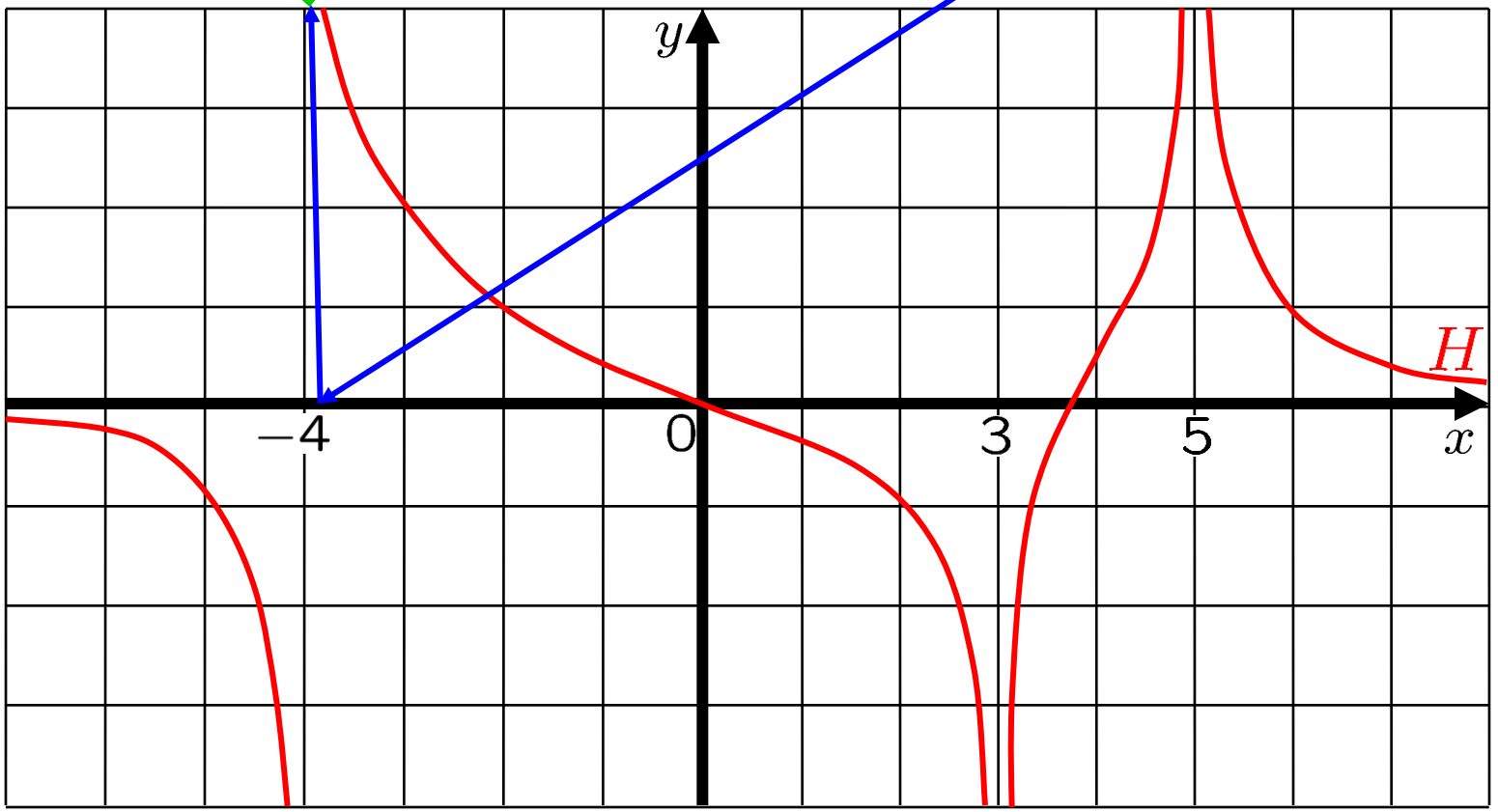

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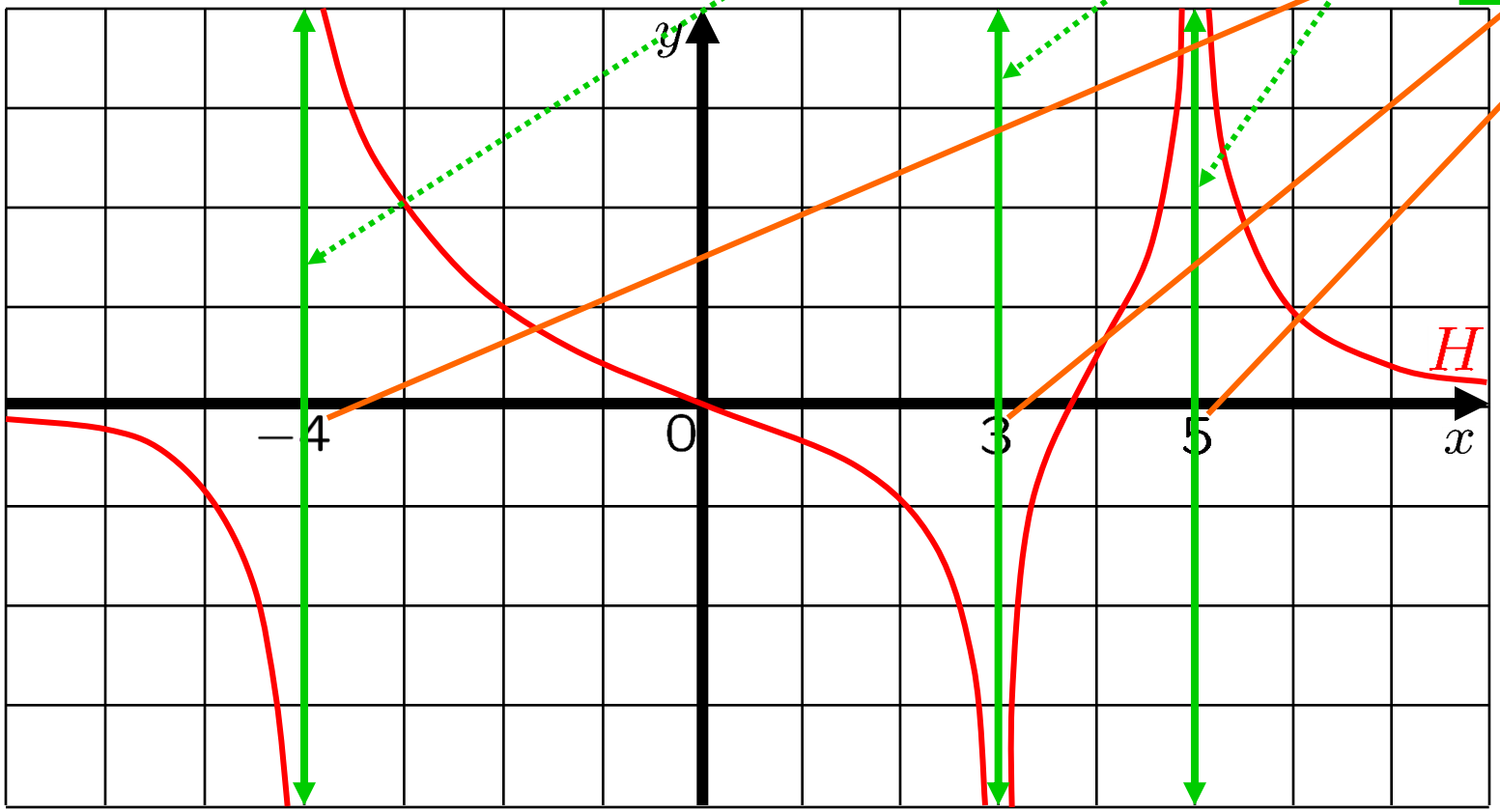
$x = -4$
$x = 3$
$x = 5$

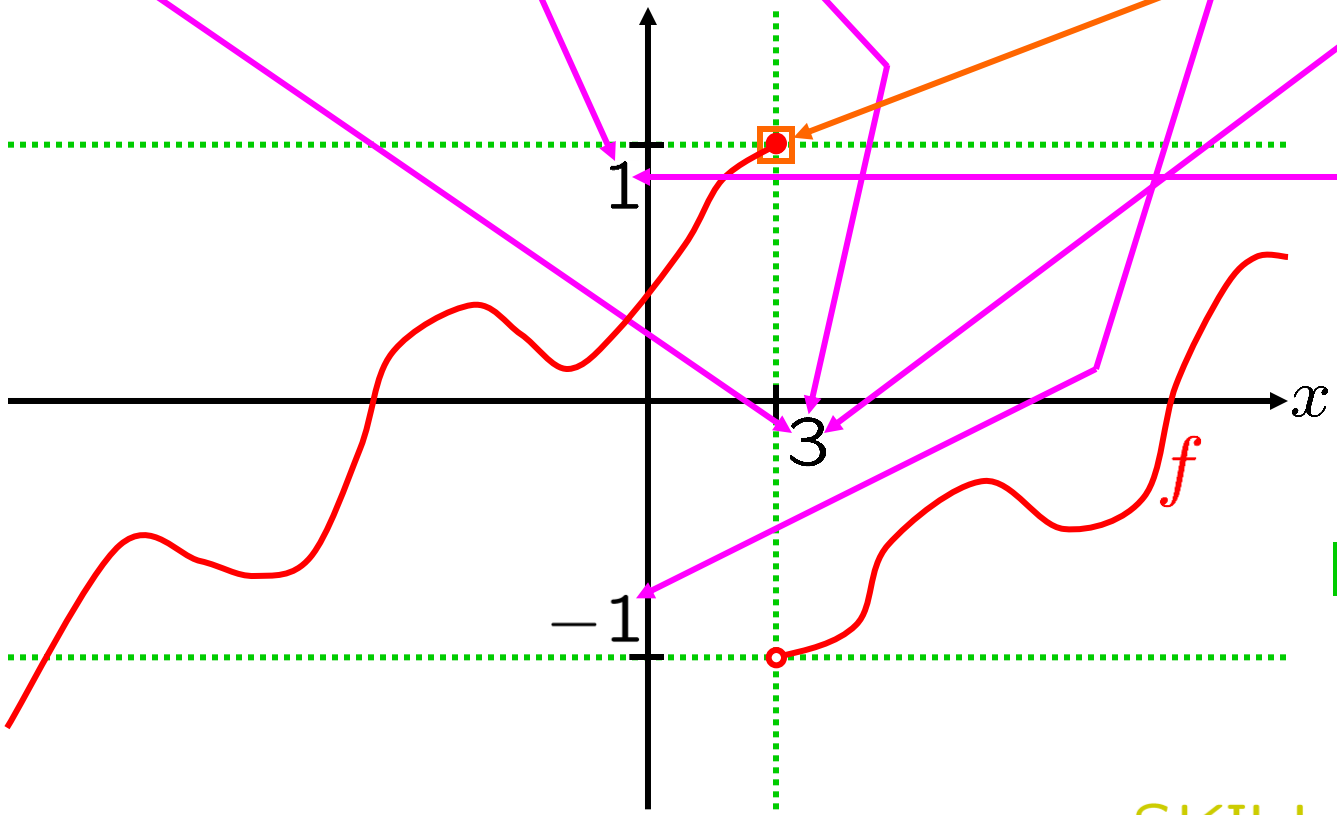


SKILL
lim from gph

Exercise 3:

Sketch the graph of an example of a function f that satisfies all of the given conditions.

$\lim_{x \to 3^-} f(x) = 1$, $\lim_{x \to 3^+} f(x) = -1$, $f(3) = 1$



Many, many other correct answers!

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gph from data

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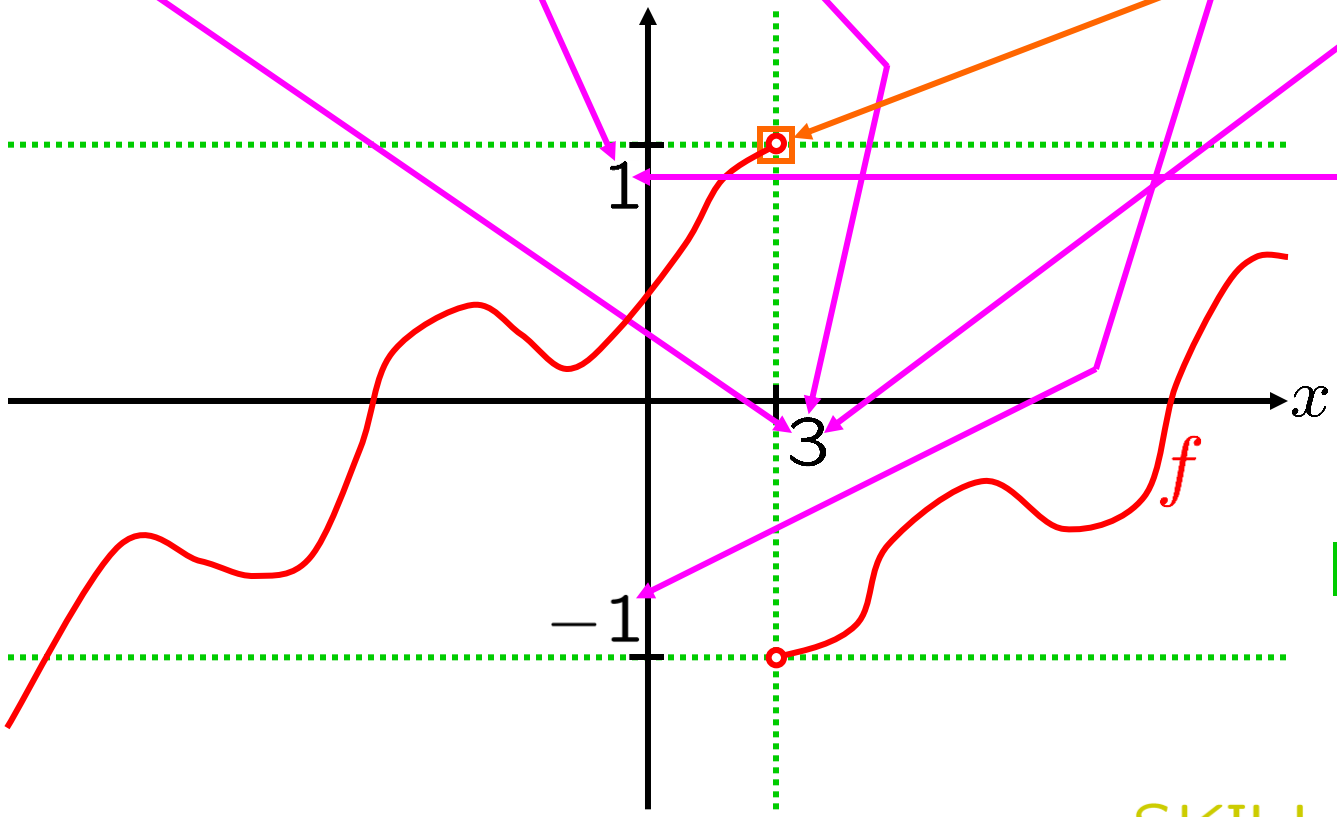

Many, many other correct answers!

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Exercise 4:

SKILL
lim ratl fn

Determine the infinite limit.

one-sided limit

$$\lim_{x \to -5^{=}} \boxed{\frac{x+3}{x+5}} = \infty$$

quotient of polynomials \\ rational expression

denominator

A one-sided limit of a rational expression with denom. $\to 0$ and num. $\not\to 0$ is ∞ or $-\infty$. Which?

$x + 5 \to 0$

$$\left[\frac{x+3}{x+5}\right]_{x:\to -5-0.001} = \frac{-5-0.001+3}{-5-0.001+5}$$

$$= \frac{+2.001}{+0.001}$$

$= 2,001$ is very positive

Exercise 4:

SKILL
lim ratl fn

Determine the infinite limit.

$$\lim_{x \to -5^-} \frac{x+3}{x+5} = \infty$$ ■

A one-sided limit of a rational expression with denom. $\to 0$ and num. $\not\to 0$ is ∞ or $-\infty$. Which?

Another way to say the same thing:

$$\frac{x+3}{x+5}$$

$$\frac{\text{negative}}{\text{small negative}}$$

$x \to -5^-$

∞

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$$\lim_{x \to -5} \frac{x+3}{x+5}$$

$\frac{\text{negative}}{\text{small positive}}$ $x \to -5^+$ $-\infty$

does not exist.

$\frac{\text{negative}}{\text{small negative}}$ $x \to -5^-$ ∞

A one-sided limit of a rational expression with denom. $\to 0$ and num. $\not\to 0$ is ∞ or $-\infty$. Which?

A two-sided limit of a rational expression with denom. $\to 0$ and num. $\not\to 0$ is ∞ or $-\infty$, PROVIDED it exists.

$$\lim_{x \to -5} \frac{x+3}{x+5}$$ does not exist.

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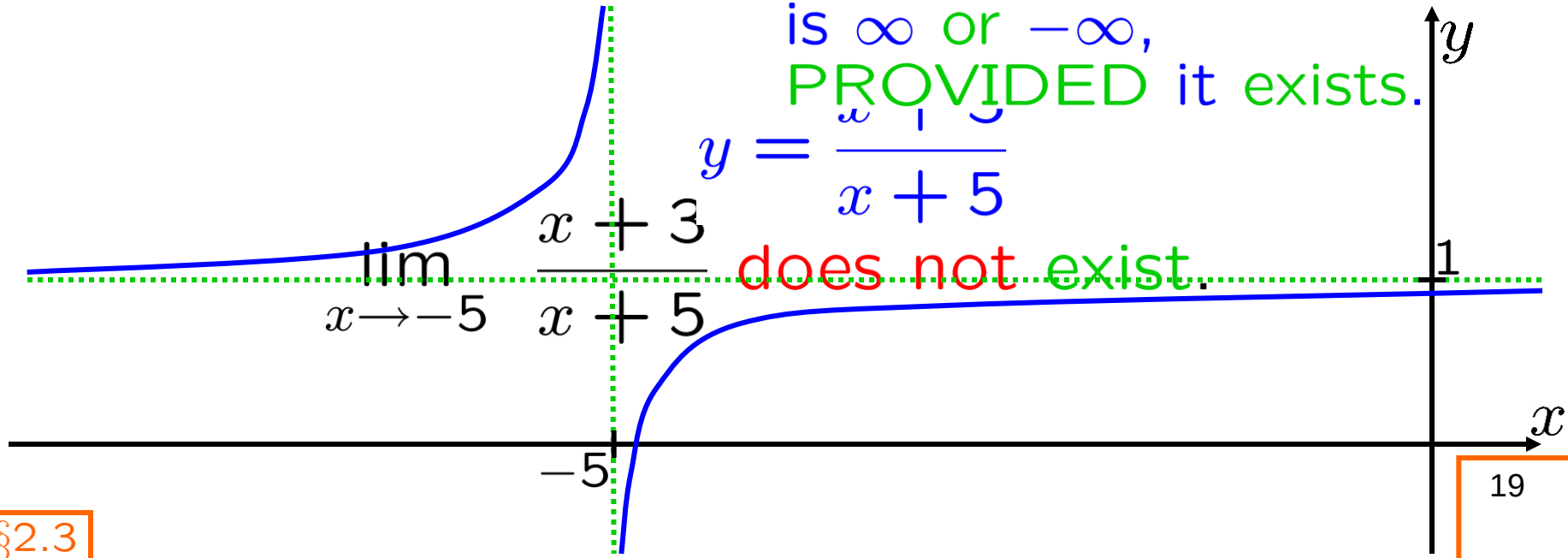

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STOP