

$$1. \quad g(x) = \begin{cases} \frac{x+5}{2x-4}, & x < 2 \\ 12, & x = 2 \\ 2x - 5, & 2 < x < 5 \\ 20, & x = 5 \\ \frac{-x^2+4}{5-x}, & x > 5 \end{cases}$$

Find the following:

a) $\lim_{x \rightarrow -\infty} g(x) =$

b) $\lim_{x \rightarrow 2^-} g(x) =$

c) $\lim_{x \rightarrow 2^+} g(x) =$

d) $\lim_{x \rightarrow 2} g(x) =$

e) $\lim_{x \rightarrow 5^-} g(x) =$

f) $\lim_{x \rightarrow 5^+} g(x) =$

g) $\lim_{x \rightarrow 5} g(x) =$

h) $\lim_{x \rightarrow 3^+} g(x) =$

i) $\lim_{x \rightarrow \infty} g(x) =$

Use Continuity conditions to justify whether $f(x)$ is continuous or discontinuous. If discontinuous, identify type of discontinuity

$$2) \quad f(x) = \begin{cases} 2x^2 + 5, & x \geq 3 \\ 2^x, & x < 3 \end{cases}$$

3) Find the horizontal asymptote(s) of

$$f(x) = \frac{-2x-5}{\sqrt{6x^2+11x-30}}$$

4) Find $\lim_{x \rightarrow 3} \frac{\sqrt{x+1}-2}{x-3}$

5) Let $f(x) = \begin{cases} \frac{x^2-9}{x-3}, & x \neq 3 \\ 6, & x = 3 \end{cases}$

Which of the following is true? (Circle all that apply)

I. $\lim_{x \rightarrow 3} f(x)$ does not existII. f is continuous at $x = 3$ III. The line $x = 3$ is a vertical asymptote:

$$6. \text{ Let } f(x) = \begin{cases} \frac{x^2-7x+10}{x^2-25}, & x^2 \neq 25 \\ A, & x = 5 \\ B, & x = -5 \end{cases}$$

a) Are the lines $x = 5$ and $x = -5$ vertical asymptotes? Justify answer

b) Identify all horizontal asymptotes. Justify answer

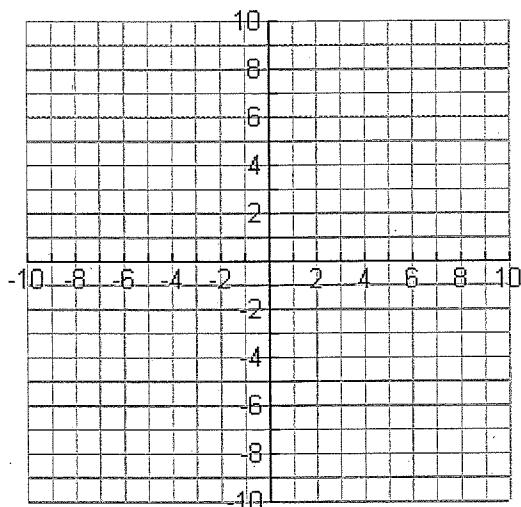
c) Is there a value of A that makes f continuous at $x = 5$?

d) Is there a value of B that makes f continuous at $x = -5$?

x	1	3	5	8
f(x)	-2	4	10	6

7. If f is continuous on $[1,8]$ and some values of f are given in the table above, which of the following must be true? Circle all that apply.

I. $f(x) = -3$ has a solution in $[1,8]$ II. $f(x) = 0$ has a solution in $[1,8]$ III. $f(x) = 9$ has a solution in $[1,8]$



8) Find value of given quantity

a) $\lim_{x \rightarrow -\infty} h(x) = -6$ f) $\lim_{x \rightarrow 0} h(x) = \text{DNE}$

b) $\lim_{x \rightarrow -4^-} h(x) = -3$ g) $\lim_{x \rightarrow 3^+} h(x) = -4$

c) $\lim_{x \rightarrow -2} h(x) = 1$ h) $\lim_{x \rightarrow 4} h(x) = -\infty$

d) $h(0) = 2$ i) $\lim_{x \rightarrow 8} h(x) = 3$

e) $\lim_{x \rightarrow 0^-} h(x) = 2$ j) $\lim_{x \rightarrow \infty} h(x) = 8$

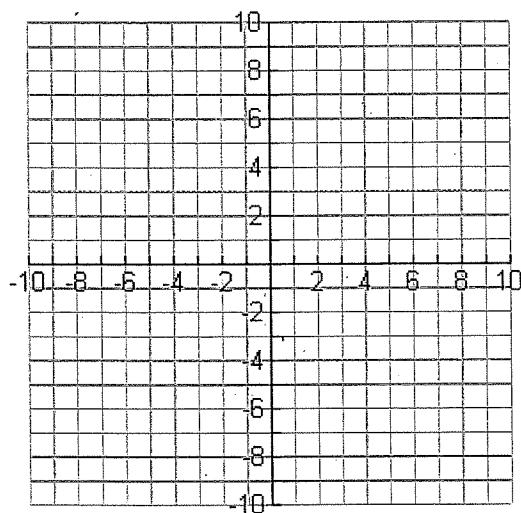
9) Sketch graph of function satisfying the given values!

a) $\lim_{x \rightarrow -\infty} f(x) = 8$ e) $\lim_{x \rightarrow 1^+} f(x) = -4$

b) $f(-5) = 3$ f) $\lim_{x \rightarrow 3} f(x) = +\infty$

c) $\lim_{x \rightarrow -5} f(x) = \text{DNE}$ g) $\lim_{x \rightarrow +\infty} f(x) = -4$

d) $\lim_{x \rightarrow 1^-} f(x) = 3$



$$1. g(x) = \begin{cases} \frac{x+5}{2x-4}, & x < 2 \\ 12, & x = 2 \\ 2x - 5, & 2 < x < 5 \\ 20, & x = 5 \\ \frac{-x^2+4}{5-x}, & x > 5 \end{cases}$$

a) $\lim_{x \rightarrow -\infty} g(x) =$ 1/2

b) $\lim_{x \rightarrow 2^-} g(x) =$ -∞

Correction

c) $\lim_{x \rightarrow 2^+} g(x) =$ +∞ -1

d) $\lim_{x \rightarrow 2} g(x) =$ ONE

e) $\lim_{x \rightarrow 5^-} g(x) =$ 5

f) $\lim_{x \rightarrow 5^+} g(x) =$ +∞

g) $\lim_{x \rightarrow 5} g(x) =$ ONE

h) $\lim_{x \rightarrow 3^+} g(x) =$ 1

i) $\lim_{x \rightarrow \infty} g(x) =$ +∞

Use Continuity conditions to justify whether $f(x)$ is continuous or discontinuous. If discontinuous, identify type of discontinuity

i) $f(3) = 2(3)^2 + 5 = 23$

ii) $\lim_{x \rightarrow 3^-} 2^x = 8$ and $\lim_{x \rightarrow 3^+} 2x^2 + 5 = 23$ so $\lim_{x \rightarrow 3} f(x) = \text{ONE}$
Non-removable discontinuity at $x=3$

3) Find the horizontal asymptote(s) of

$$f(x) = \frac{-2x-5}{\sqrt{6x^2+11x-30}}$$

$$\lim_{x \rightarrow +\infty} \frac{-2x-5}{\sqrt{6x^2+11x-30}} = \frac{-2}{\sqrt{6}} = \frac{-2}{\sqrt{6}}$$

4) Find $\lim_{x \rightarrow 3} \frac{\sqrt{x+1}-2}{x-3} \cdot \frac{\sqrt{x+1}+2}{\sqrt{x+1}+2}$

$$\lim_{x \rightarrow 3} \frac{x+1-4}{(x-3)(\sqrt{x+1}+2)} = \frac{-3}{(x-3)(\sqrt{x+1}+2)}$$

$$\lim_{x \rightarrow 3} \frac{(x-3)}{(x-3)(\sqrt{x+1}+2)} = \frac{1}{4}$$

5) Let $f(x) = \begin{cases} \frac{x^2-9}{x-3}, & x \neq 3 \\ 6, & x = 3 \end{cases}$

$\lim_{x \rightarrow 3} f(x)$ does not exist

Which of the following is true? (Circle all that apply)

$$\frac{x^2-9}{x-3} = \frac{(x-3)(x+3)}{(x-3)} \quad \lim_{x \rightarrow 3} x+3 = 6$$

II. f is continuous at $x = 3$

The line $x = 3$ is a vertical asymptote:

i) $f(3) = 6$

ii) $\lim_{x \rightarrow 3} \frac{x^2-9}{x-3} = 6$

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

All continuity condition passes.

6. Let $f(x) = \begin{cases} \frac{x^2-7x+10}{x^2-25}, & x^2 \neq 25 \\ A, & x=5 \\ B, & x=-5 \end{cases}$

$$\frac{(x-5)(x-2)}{(x-5)(x+5)}$$

At $x=5$ is a hole since factor cancels in denominator
At $x=-5$, vertical asymptote

a) Are the lines $x=5$ and $x=-5$ vertical asymptotes? Justify answer

b) Identify all horizontal asymptotes. Justify answer $\lim_{x \rightarrow -\infty} f(x) = 1$ $\lim_{x \rightarrow +\infty} f(x) = 1$

c) Is there a value of A that makes f continuous at $x=5$? yes, $\lim_{x \rightarrow 5} \frac{x-2}{x+5} = \frac{3}{10}$ so let $A = \frac{3}{10}$

d) Is there a value of B that makes f continuous at $x=-5$? No, since nonremovable discontinuity at $x=-5$

x	1	3	5	8
$f(x)$	-2	4	10	6

7. If f is continuous on $[1,8]$ and some values of f are given in the table above, which of the following must be true? Circle all that apply.

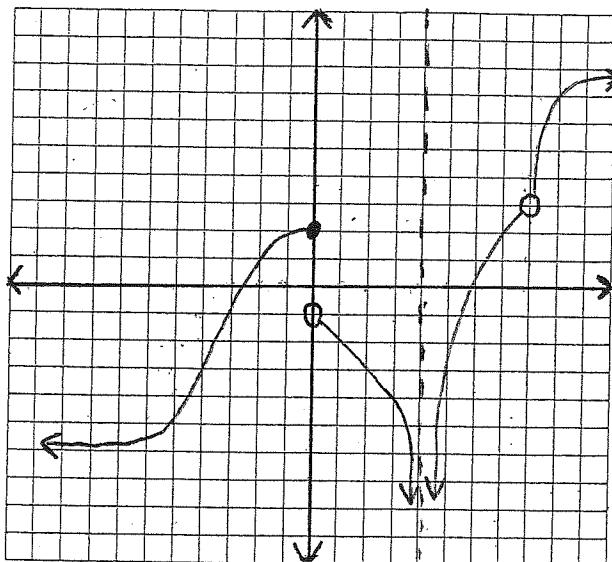
i) $f(x) = -3$ has a solution in $[1,8]$

ii) $f(x) = 0$ has a solution in $[1,8]$

iii) $f(x) = 9$ has a solution in $[1,8]$

By IVT, since
 $f(1) < 0 < f(8)$,
c exists in $[1,8]$

By IVT, since $f(1) < 9 < f(8)$,
c exists in $[1,5]$ therefore
would exist in $[1,8]$



8) Find value of given quantity

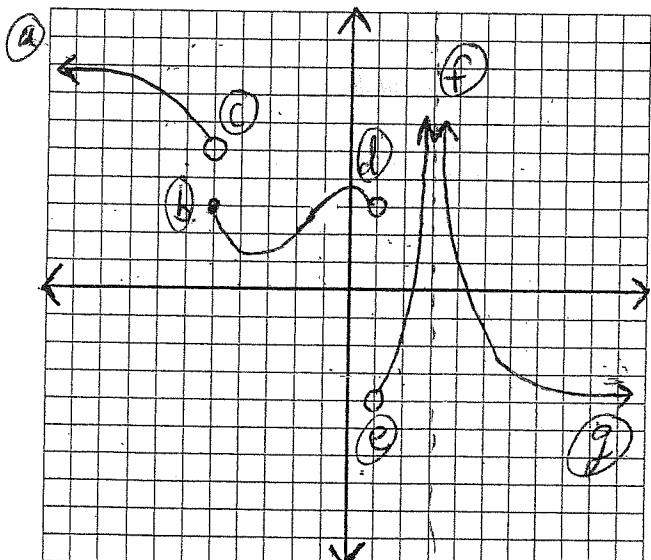
a) $\lim_{x \rightarrow -\infty} h(x) = -6$ f) $\lim_{x \rightarrow 0} h(x) = \text{DNE}$

b) $\lim_{x \rightarrow -4^-} h(x) = -3$ g) $\lim_{x \rightarrow 3^+} h(x) = -4$

c) $\lim_{x \rightarrow -2} h(x) = 1$ h) $\lim_{x \rightarrow 4} h(x) = -\infty$

d) $h(0) = 2$ i) $\lim_{x \rightarrow 8} h(x) = 3$

e) $\lim_{x \rightarrow 0^-} h(x) = 2$ j) $\lim_{x \rightarrow \infty} h(x) = 8$



Sketch graph of function satisfying the given values!

a) $\lim_{x \rightarrow -\infty} f(x) = 8$

e) $\lim_{x \rightarrow 1^+} f(x) = -4$

b) $f(-5) = 3$

f) $\lim_{x \rightarrow 3} f(x) = +\infty$

c) $\lim_{x \rightarrow -5} f(x) = \text{DNE}$

g) $\lim_{x \rightarrow +\infty} f(x) = -4$

d) $\lim_{x \rightarrow 1^-} f(x) = 3$