Übungen zur h-Methode

Aufgaben: Untersuchen Sie die folgenden Funktionen in ihren Definitionslücken (Nahtstellen) auf Grenzwerte.

(1) $f1(x) := \frac{1}{x}$

(2) $f2(x) := \frac{4x + 1}{1 + x}$

(3) $f3(x) := \frac{x^4}{x^2}$

(4) $f4(x) := \frac{|x - 5|}{|x| - 5}$

(5) $f5(x) := \frac{4 - x^2}{x + 2}$

(6) $f6a(x) := \frac{x}{x} + x$ für x>0

$f6b(x) := \frac{-x}{x} - x$ für x<0

(7) $f7a(x) := x - 2$ für x>2

$f7b(x) := -x + 2$ für x<2

(8) $f8a(x) := x^2$ für $-1 < x < 1$

$f8b(x) := 3x - 2$ für $1 < x < 2$

$f8c(x) := 7 - \frac{6}{x}$ für $2 < x < 5$

(9) $f9a(x) := |x|$ für $x < 0$

$f9b(x) := \frac{1}{x - 1}$ für $x > 0$

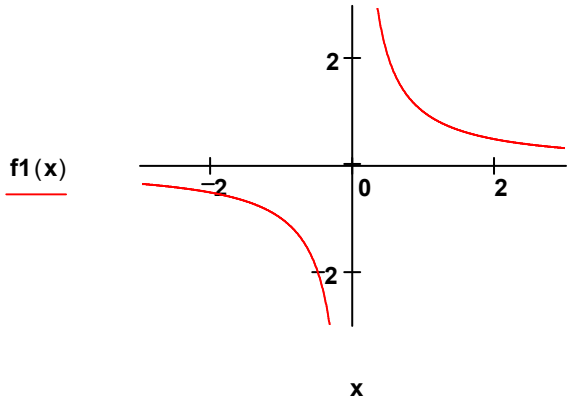
Lösungen:

(1) $f1(x) := \frac{1}{x}$

LS $\lim_{h \to 0} f1(0 - h) = -\infty$

RS $\lim_{h \to 0} f1(0 + h) = \infty$

$x := -3, -2.995 .. 3$

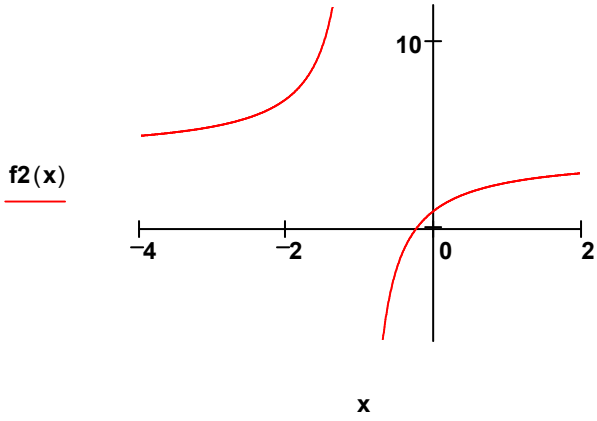


(2) $f2(x) := \frac{4x + 1}{1 + x}$

LS $\lim_{h \to 0} f2(-1 - h) = \infty$

RS $\lim_{h \to 0} f2(-1 + h) = -\infty$

$x := -4, -3.995 .. 2$

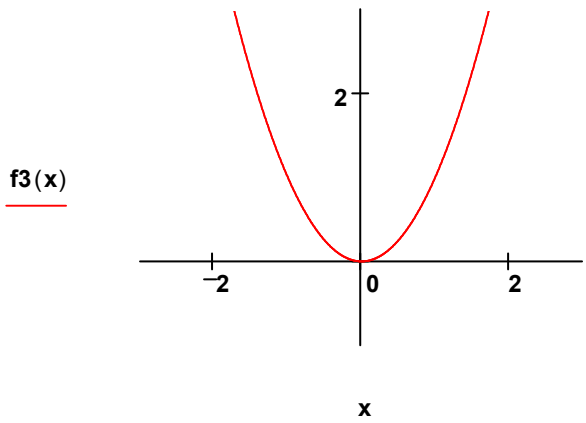


(3) $f3(x) := \frac{x^4}{x^2}$

LS $\lim_{h \to 0} f3(0 - h) \to 0$

RS $\lim_{h \to 0} f3(0 + h) \to 0$

$x := -3, -2.995 .. 3$



(4) $f4(x) := \dfrac{|x-5|}{|x|-5}$

x0 = - 5

LS $\lim_{h\to 0} \dfrac{|-5-h-5|}{|-5-h|-5} = \lim_{h\to 0} \dfrac{|-10-h|}{|-5-h|-5} = \lim_{h\to 0} \dfrac{10+h}{5+h-5} = \lim_{h\to 0} \dfrac{10+h}{h} = \infty$

$h < 5$

RS $\lim_{h\to 0} \dfrac{|-5+h-5|}{|-5+h|-5} = \lim_{h\to 0} \dfrac{|-10+h|}{|-5+h|-5} = \lim_{h\to 0} \dfrac{10-h}{5-h-5} = \lim_{h\to 0} \dfrac{10-h}{-h} = -\infty$

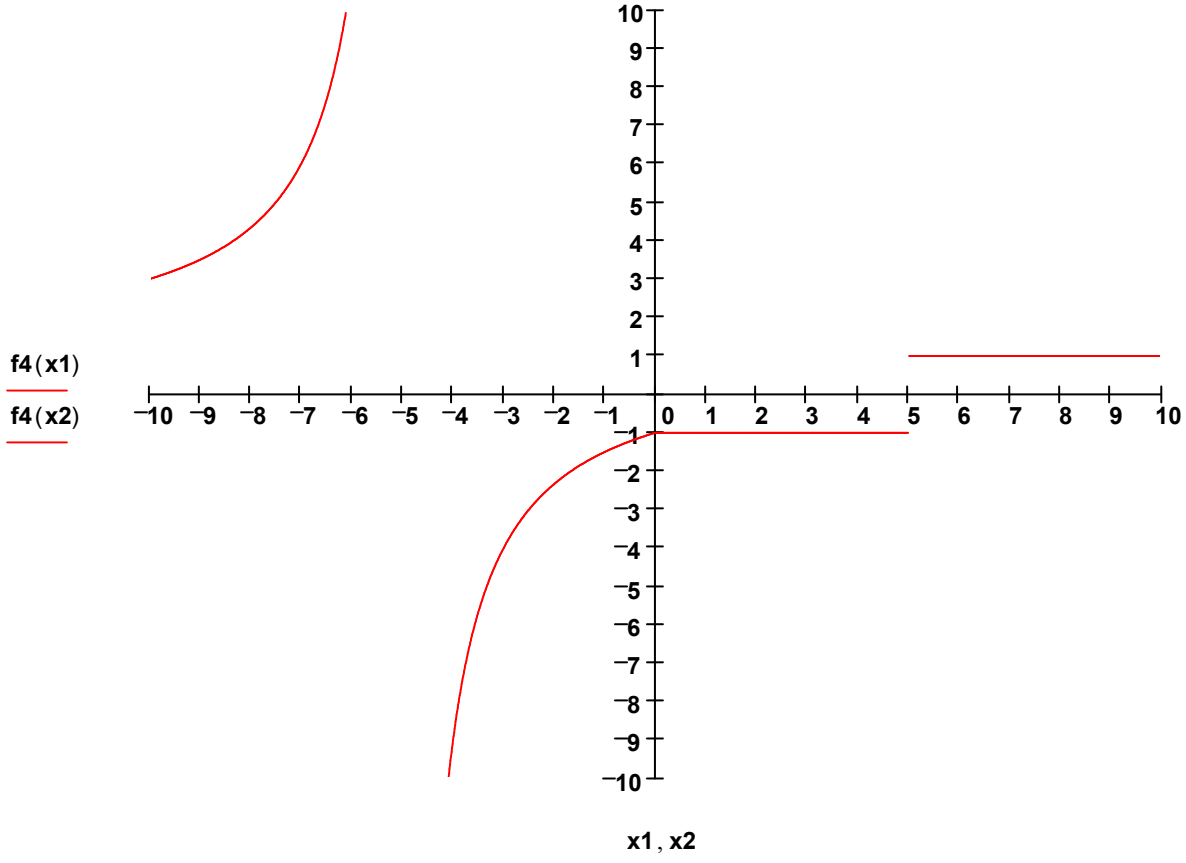
$h < 5$

x0 = 5

LS $\lim_{h\to 0} \dfrac{|5-h-5|}{|5-h|-5} = \lim_{h\to 0} \dfrac{|-h|}{|5-h|-5} = \lim_{h\to 0} \dfrac{h}{5-h-5} = \lim_{h\to 0} \dfrac{h}{-h} = -1$

RS $\lim_{h\to 0} \dfrac{|5+h-5|}{|5+h|-5} = \lim_{h\to 0} \dfrac{|h|}{|5+h|-5} = \lim_{h\to 0} \dfrac{h}{5+h-5} = \lim_{h\to 0} \dfrac{h}{h} = 1$

$x1 := -10, -9.99 .. 4.99 \quad x2 := 5.01, 5.02 .. 10$

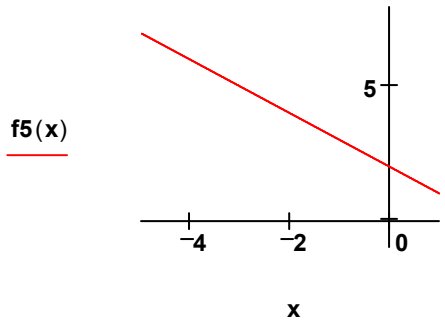


(5) $f5(x) := \dfrac{4 - x^2}{x + 2}$

$x := -5, -4.99 .. 1$

LS $\lim_{h \to 0} f5(-2 - h) \to 4$

RS $\lim_{h \to 0} f5(-2 + h) \to 4$



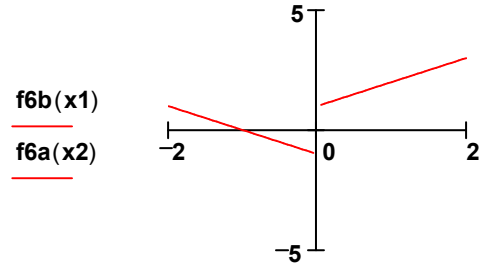
(6) $f6a(x) := \dfrac{x}{x} + x$ für x>0

$f6b(x) := \dfrac{-x}{x} - x$ für x<0

$x1 := -2, -1.95 .. -0.05$ $x2 := 0.05, 0.1 .. 2$

LS $\lim_{h \to 0} f6b(0 - h) \to -1$

RS $\lim_{h \to 0} f6a(0 + h) \to 1$



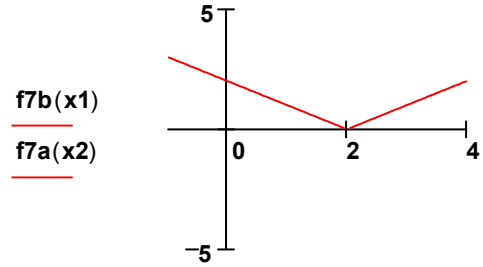
(7) $f7a(x) := x - 2$ für x>2

$f7b(x) := -x + 2$ für x<2

$x1 := -1, -0.95 .. 1.95$ $x2 := 2.05, 2.1 .. 4$

LS $\lim_{h \to 0} f7b(2 - h) \to 0$

RS $\lim_{h \to 0} f7a(2 + h) \to 0$



(8) $f8a(x) := x^2$ für $-1 < x < 1$

$f8b(x) := 3x - 2$ für $1 < x < 2$

$f8c(x) := 7 - \frac{6}{x}$ für $2 < x < 5$

$x1 := -1, -0.99 .. 1 \quad x2 := 1, 1.01 .. 2 \quad x3 := 2, 2.01 .. 5$

x0 = 1

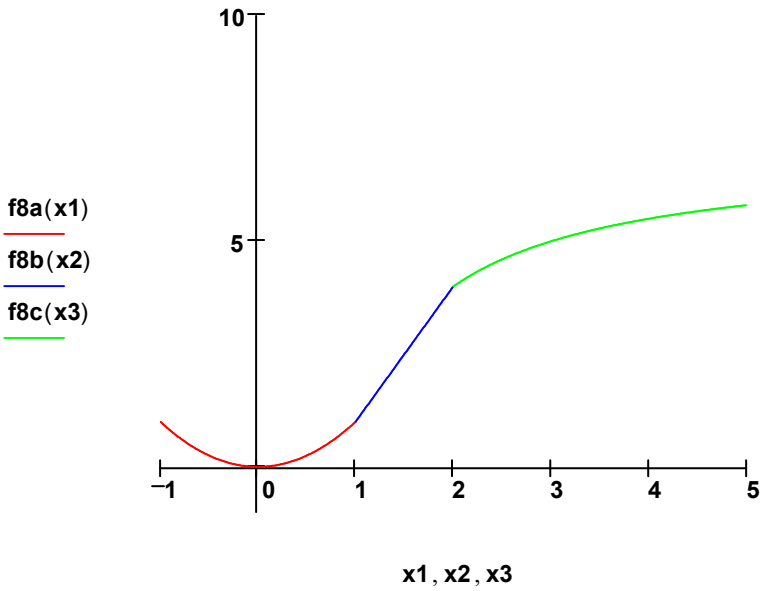
LS $\lim_{h \to 0} f8a(1 - h) \to 1$

RS $\lim_{h \to 0} f8b(1 + h) \to 1$

x0 = 2

LS $\lim_{h \to 0} f8b(2 - h) \to 4$

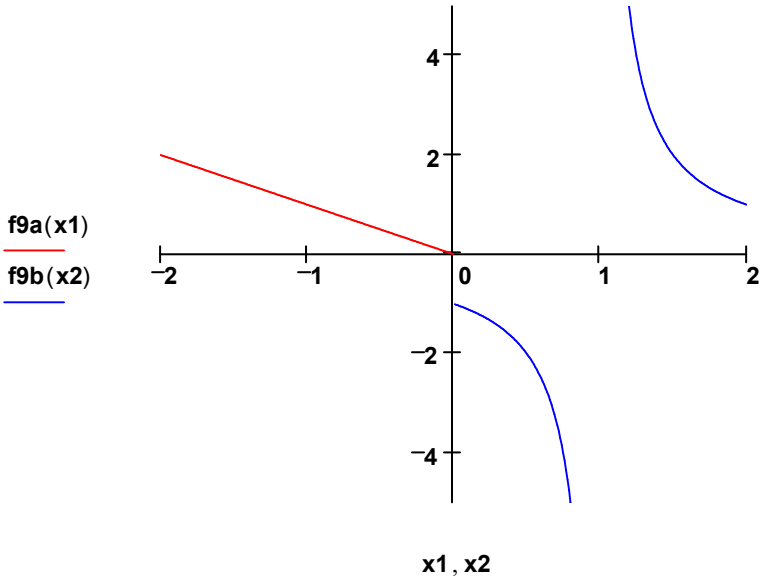
RS $\lim_{h \to 0} f8c(2 + h) \to 4$



(9) $f9a(x) := |x|$ für $x < 0$

$f9b(x) := \frac{1}{x - 1}$ für $x > 0$

$x1 := -2, -1.99 .. 0 \quad x2 := 0.01, 0.02 .. 2$

LS $\lim_{h \to 0} f9a(0 - h) \to 0$

RS $\lim_{h \to 0} f9b(0 + h) \to -1$