24-Sep-2020

Q Find the limit of f(x) = 1/x² at x = 0 and f(x) = 1/x^4 at ∞

(%i1) f (x) : = 1 / x ^ 2 ;

(%o1) $f(x) := \frac{1}{x^2}$

(%i2) limit (f (x) , x , 0) ;

(%o2) ∞

(%i3) f (x) : = 1 / x ^ 4 ;

(%o3) $f(x) := \frac{1}{x^4}$

(%i4) limit (f (x) , x , ∞) ;

(%o4) 0

Q Find the right and left hand limit of 1/x at x = 0

(%i5) f (x) : = 1 / x ;

(%o5) $f(x) := \frac{1}{x}$

(%i6) limit (f (x) , x , 0 , minus) ;

(%o6) - ∞

(%i7) limit (f (x) , x , 0 , plus) ;

(%o7) ∞

Q Find the right and left hand limit of |x/|x|| at x = 0
and what can you conclude from it

(%i8) f (x) : = abs (x / (abs (x))) ;

(%o8) $f(x) := \left| \frac{x}{|x|} \right|$

(%i9) limit (f (x) , x , 0 , minus) ;

(%o9) 1

(%i10) limit (f (x) , x , 0 , plus) ;

(%o10) 1

(%i11) limit (f (x) , x , 0) ;

(%o11) 1

the limit of f(x) = |x/|x|| exist at x = 0 and it is 1

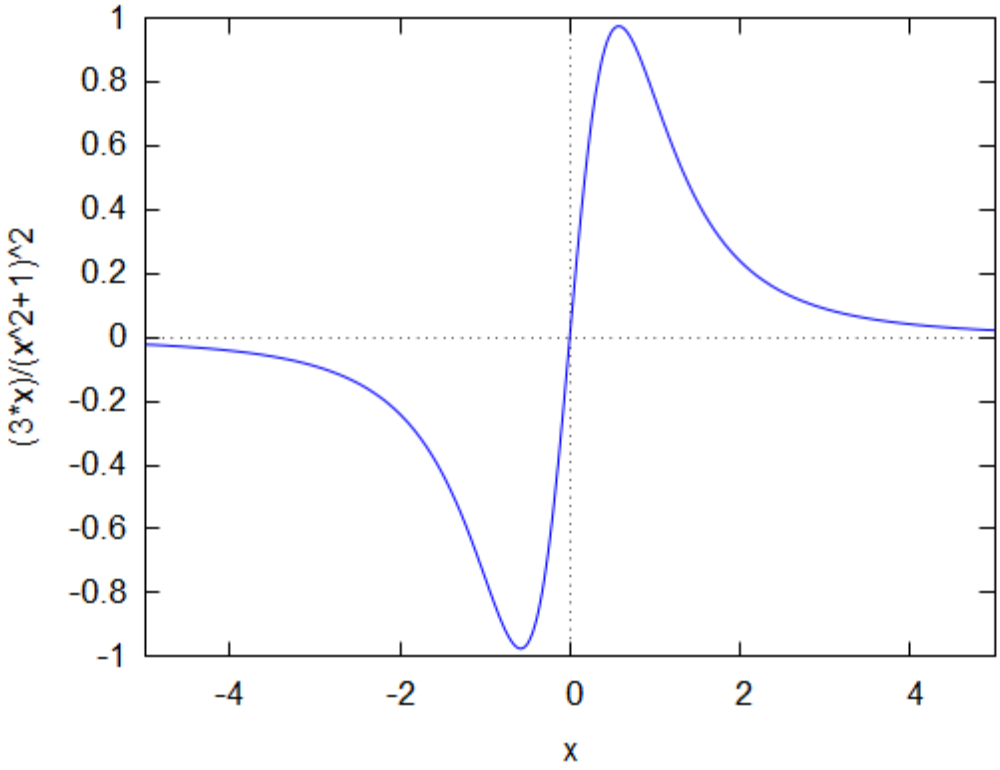
Q Find points of maxima and minima for f(x) = 3x/(x²+1)² also find maximum and minimum value of f(x) and plot the graph of f(x)

(%i12) f(x):=3·x/(x^2+1)^2;

(%o12) $$f(x):=\frac{3x}{(x^2+1)^2}$$

(%i13) wxplot2d(f(x),[x,-5,5]);

(%t13)



(%o13)

(%i14) solve(diff(f(x),x)=0,x);

(%o14) $$[x=-\frac{1}{\sqrt{3}},x=\frac{1}{\sqrt{3}}]$$

(%i15) d2f(x):=''(diff(f(x),x,2));

(%o15) $$d2f(x):=\frac{72x^3}{(x^2+1)^4}-\frac{36x}{(x^2+1)^3}$$

(%i16) d2f(-1/(sqrt(3)));

(%o16) $$\frac{3^{\frac{9}{2}}}{32}$$

(%i17) d2f(1/(sqrt(3)));

(%o17) $$-\frac{3^{\frac{9}{2}}}{32}$$

f(x) is minimum at x = -1/sqrt(3) as f''(x) at x = -1/sqrt(3) is +ive and f(x) is maximum at x = 1/sqrt(3) as f''(x) at x = 1/sqrt(3) is -

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(%i18) f ( − 1 / sqrt ( 3 ) ) ;
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$$(\%o18) \quad -\frac{3^{\frac{5}{2}}}{16}$$

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(%i19) f ( 1 / sqrt ( 3 ) ) ;
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$$(\%o19) \quad \frac{3^{\frac{5}{2}}}{16}$$

maximum value of f(x) is 3^(5/2)/16 and minimum value of f(x) is -3^(5/2)/16

Q Find points of maxima and minima for f(x) = 1/(x - %e^x) also find maximum and minimum value of f(x) and plot the graph of f(x)

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(%i20) f ( x ) : = 1 / ( x − %e ^ x ) ;
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$$(\%o20) \quad f(x) := \frac{1}{x - \%e^x}$$

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(%i21) wxplot2d ( f ( x ) , [ x , − 2 , 2 ] ) ;
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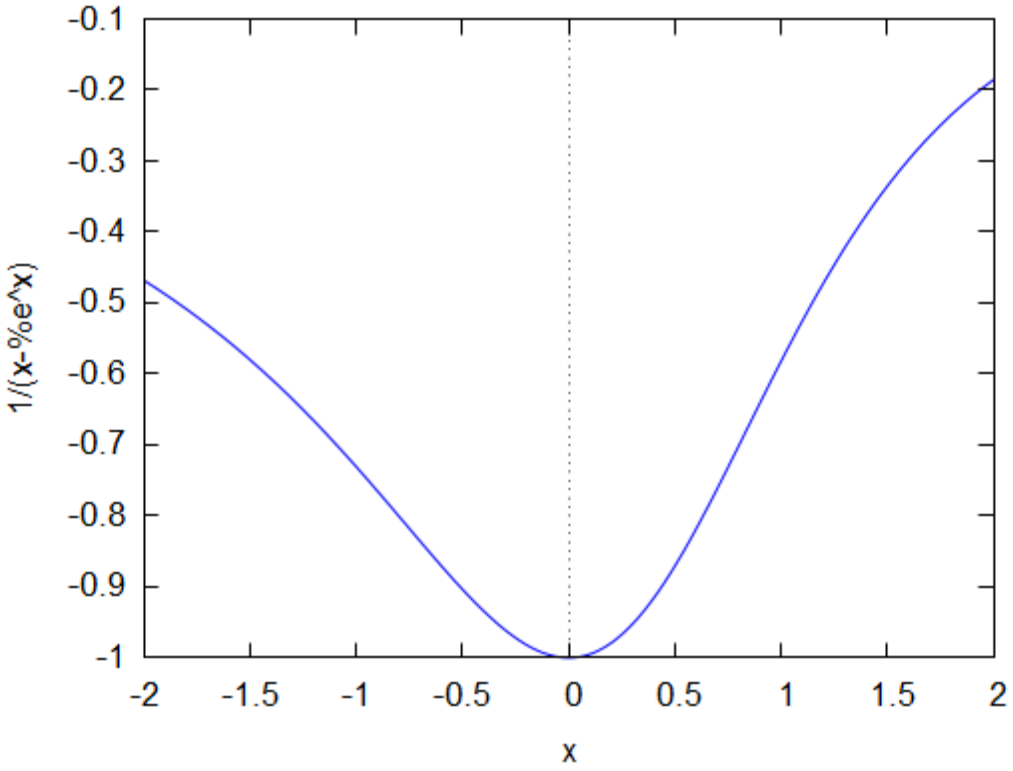
(%t21)



(%o21)

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(%i22) solve ( diff ( f ( x ) , x ) = 0 , x ) ;
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$$(\%o22) \quad [x = 0]$$

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(%i23) d2f ( x ) : = ' ' ( diff ( f ( x ) , x , 2 ) ) ;
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(%o23) $$\mathrm{d2f}(x) := \frac{\%e^x}{\left(x - \%e^x\right)^2} + \frac{2\left(1 - \%e^x\right)^2}{\left(x - \%e^x\right)^3}$$

(%i24)
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d2f ( − log ( log ( %e ) ) / log ( e ) ) ;
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(%o24) 1

f(x) is minimum at x = 1 as f''(x)
at x = 0 is 1 and there is no
maximum.

(%i25)
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f ( 0 ) ;
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(%o25) -1

minimum value of f(x) is -1 at x = 0.
