

After opening Maple:

In the toolbar you will see a capital T, when that is clicked you will be in Text mode. When you want to define functions, plot and perform operations you will want to be in Math mode. You select this mode by clicking on the $\left[\right]$ on the toolbar. To complete a Worksheet like this one you just toggle between the two modes.

While in math mode you can use a number of different pallets from the "Expression" pull down. Click the triangle to the left of "Expression" on the far left and the drop down menu will appear.

Define, Graph and find Limits of a function of x.

If you would like to define a function you can do so by clicking $f := a \rightarrow y$ from the pull down menu, the "a" will be the variable you want the function to be written in terms of and the "y" is the function. Be sure to use the appropriate operation, this can be done from the pull down menu or using the operations +, -, *, / on the keyboard. When you have completed entering the function press "Enter" on the keyboard.

Example:

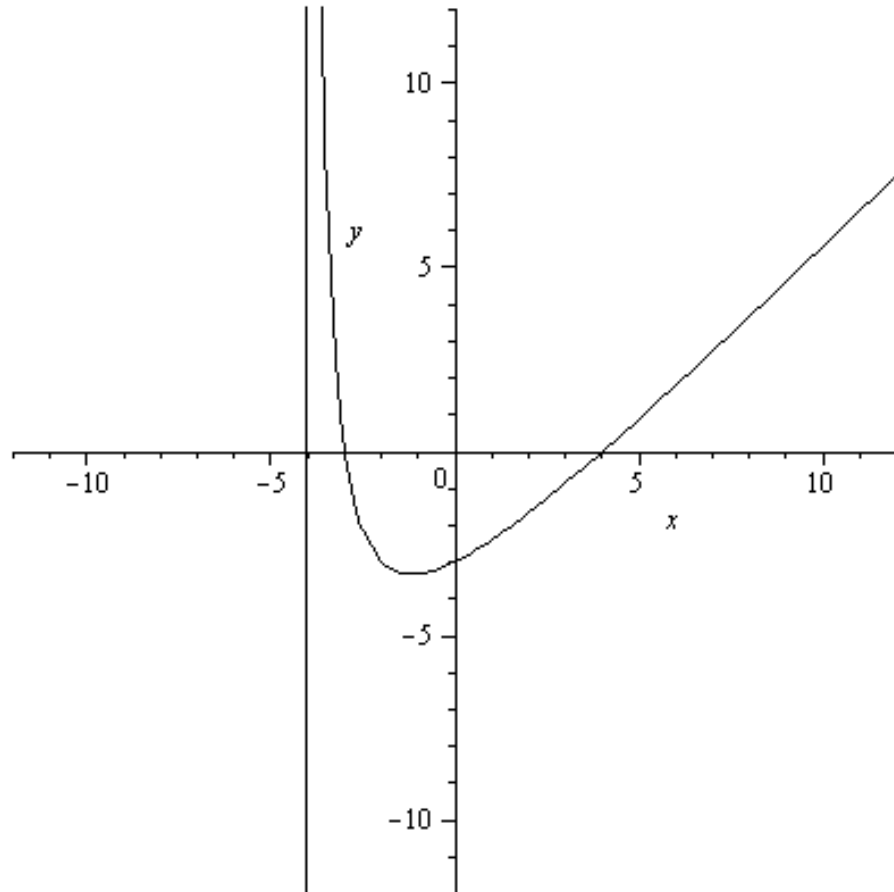
$$> f := x \rightarrow \frac{(x^2 - x - 12)}{x + 4}$$

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>

If you would like to graph the function in a particular viewing window you can do so by using the following syntax. Maple will graph in different colors, if you wish you can add "color=black" at the end of the calling sequence to have the graphs appear in black.

$$> \text{plot}(f(x), x = -12..12, y = -12..12, \text{color} = \text{black})$$

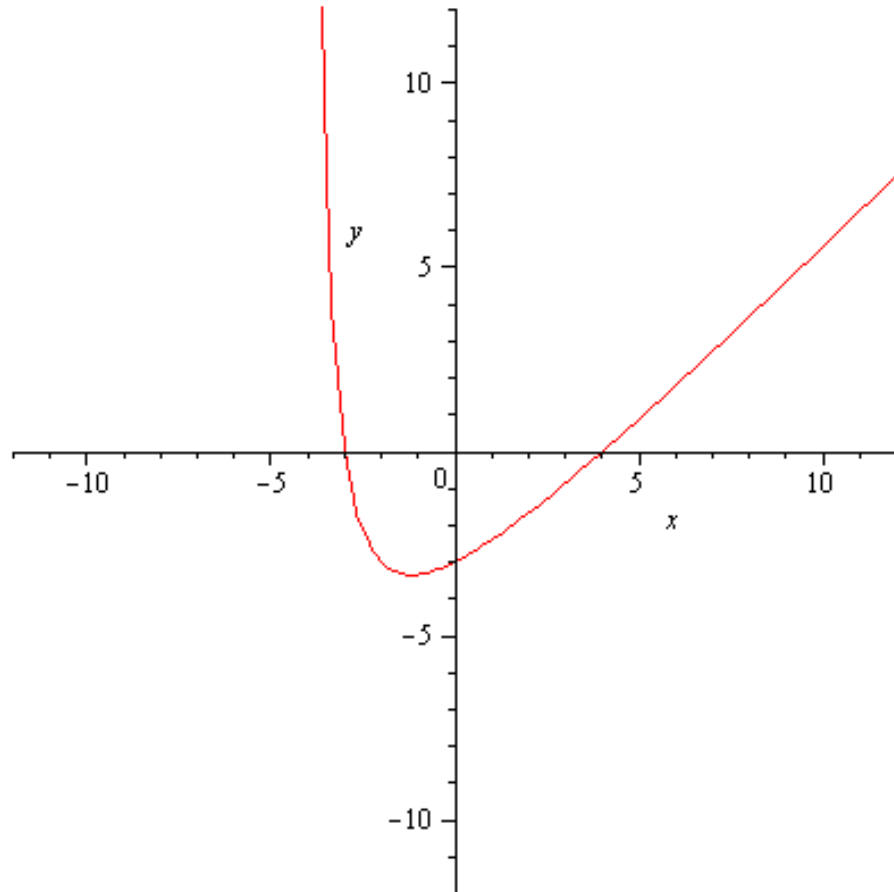


>

As you can see the vertical asymptote shows as a vertical line. If you do not wish to have this vertical line appear you can plot in the following manner.

>

`plot(f(x), x = -12..12, y = -12..12, discont = true)`



>

It is possible to have Maple evaluate the function at different values of x as well. One way to do this is to use function notation.

> $f(2)$

$$-\frac{5}{3}$$

> $f(-4)$

Error, (in f) numeric exception: division by zero

>

As you can see the function is not defined at -4. We can try to find the limit as x approaches 4. To do this you can use the limit expression from the pull down menu. We will take both the left and right hand side limits and then ask Maple to find the limit as x approaches -4.

> $\lim_{x \rightarrow -4^+} f(x)$

∞

> $\lim_{x \rightarrow -4^-} f(x)$

$-\infty$

> $\lim_{x \rightarrow -4} f(x)$

undefined

>

Finding and using derivatives.

Next we will find the derivative of the function we have defined. Again there are different ways to do this. We will use a calling sequence that allows us to define the derivative as another function. Because we will now be dealing with two different functions we must use a different "name" for the derivative function. This time we will use "g". The := symbol alone can be found in the "common symbols" pull down menu.

> $g := \frac{d}{dx} f(x)$

$$g := \frac{2x - 1}{x + 4} - \frac{x^2 - x - 12}{(x + 4)^2}$$

>

We can find where the derivative is equal to zero by using the solve feature.

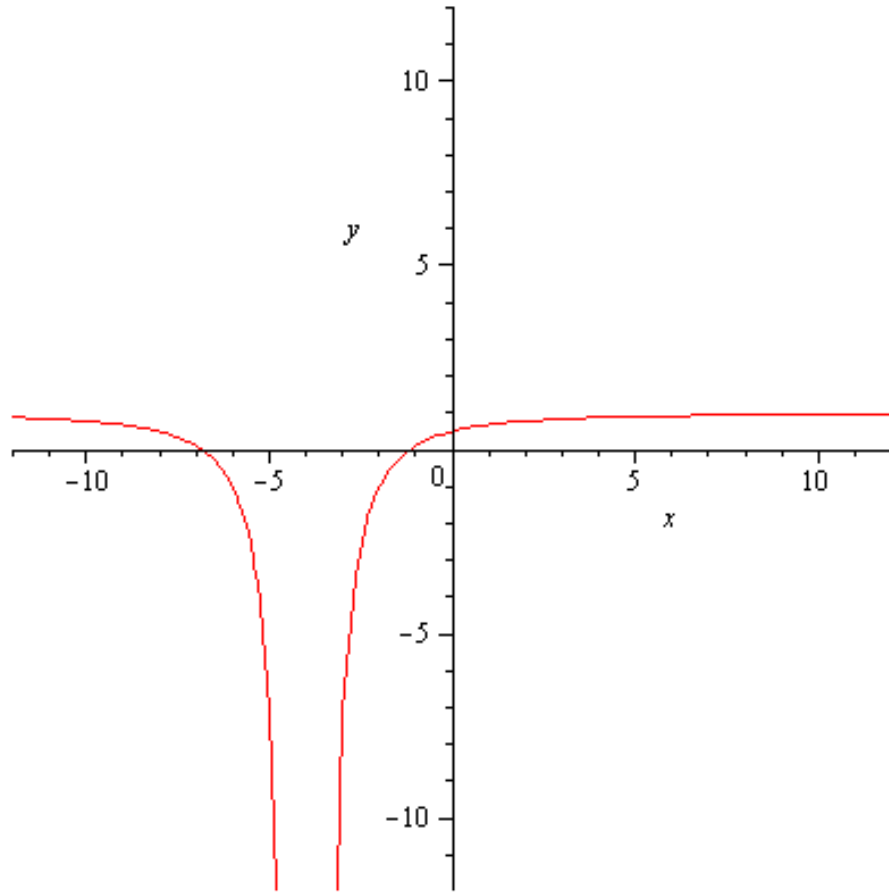
> $\text{solve}(g = 0)$

$$-4 + 2\sqrt{2}, -4 - 2\sqrt{2}$$

>

We can graph the derivative.

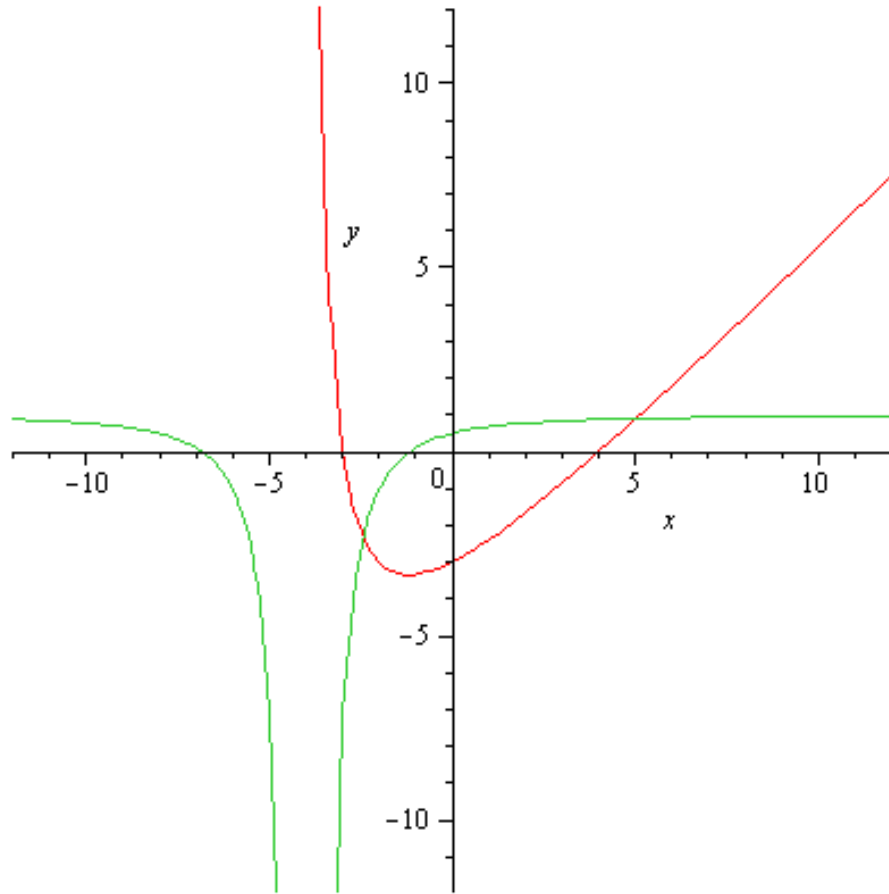
> $\text{plot}(g(x), x = -12..12, y = -12..12, \text{discont} = \text{true})$



>

We can also plot the function and derivative on the same coordinate axis.

> `plot({f(x), g(x)}, x = -12..12, y = -12..12, discont = true)`



>

We can also work with integrals. We will define a new function using "h" for the name of the function. When using trig or logarithmic functions you can again use the "expression" pull down menu or just type in the function. However, if you type in the name of the function you must use parentheses around the argument.

> $h := x \rightarrow (\cos(x))$

$h := x \rightarrow \cos(x)$

> $\int h(x) dx$

$\sin(x)$

>

We can use the definite integral (also found in the "expressions" pull down) to find the area bounded by the function, the x-axis, and two given vertical lines. The following will give the area between the curve, x-axis, $x = 0$ and $x = \pi$.

> $\int_0^{\pi} h(x) dx$

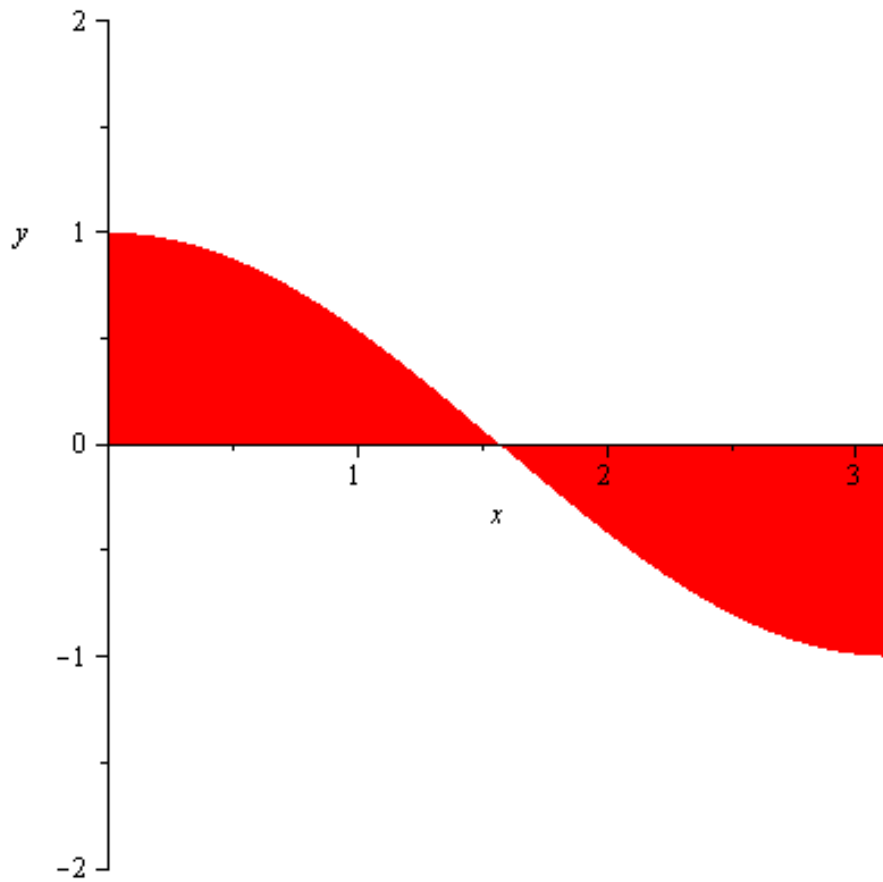
0

>

>

To look at the area using a shaded graph you can use the following calling sequence.

> `plot(h(x), x = 0 .. pi, y = -2 .. 2, filled = true)`



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