

Integral Equation

Solve an equation where the function involves an integral.

In this example, the solve key calls function f2, which in turn calls the integrate function.

Solve for x such that

$$f(x) = \int_0^x e^{\sin(t)+\cos(t)} dt = 5$$

Let function f1(t) be the function to be integrated, $e^{\sin(t)+\cos(t)}$.

f1: 1, func, 1, sto, sin, 1 rcl, cos, +, e^x

Function f2(x) will be the integral of f1 from 0 to x , minus 5

f2: 0, x \leftrightarrow y, 1, \int_a^b , 5, -

Since each call to f2 involves doing an integral, function f2 will be slower to evaluate than a function that just does a simple formula. For this reason, we may want to do a few evaluations of f2 by hand first, so we can give the solve function a good starting point that is not far from the root.

30, fix, 1.0, enter, 2, f_n f2(1.0) = -1.299764769446840637909691748752

1.5, enter, 2, f_n f2(1.5) = 0.454735321077237076366705756795

Since the function is continuous and changes sign between 1.0 and 1.5, there must be a root between 1.0 and 1.5. We can try 1.4 as the starting point for the solv key to find a root of f2(x) = 0.

1.4, enter, 2, solv

This gives the value of x that makes the integral equal to 5.

1.353517679132638821242841185126

As a check, use this as an upper limit to integrate f1.

2, sto, 0, x \leftrightarrow y, 1, \int_a^b

This shows 5.0000000000000000000000000000 in the display.