

[2.2] Try constraints or solve() in symbolic equality tests

With the 89/92+ CAS, you can set two expressions equal to each other, and the CAS can evaluate the equation and return *true* or *false* indicating whether or not the two expressions are equivalent. If the CAS cannot determine if the two expressions are equal, it returns the original equation.

When the CAS fails to resolve the equation to *true* or *false*, you can sometimes add domain constraints to enable the CAS to evaluate the equation. For example, consider

$$\frac{\sqrt{x}-1}{\sqrt{x}+1} = \frac{x-2\sqrt{x}+1}{x-1}$$

In this form, the CAS returns the original equation. If you add domain constraints on x like this

$$\frac{\sqrt{x}-1}{\sqrt{x}+1} = \frac{x-2\sqrt{x}+1}{x-1} \mid x = y^2 \text{ and } y > 0$$

the CAS will return *true*. I believe that this effect occurs because the CAS does not always interpret the square root function as exponentiation to the power of 1/2; see [2.10] *CAS square root simplification limitations*.

If both expressions are fractions, you can try this function:

```
frctest(a,b)
func
expand(getnum(a))*expand(getdenom(b))=expand(getnum(b))*expand(getdenom(a))
Endfunc
```

This function cross-multiplies the expanded numerators and denominators of the equation expressions. a and b are the expressions on the left- and right-hand sides of the equality. For the example above,

```
frctest((sqrt(x)-1)/(sqrt(x)+1),(x-2*sqrt(x)+1)/(x-1))
```

returns *true*.

Alternatively, try solving the expression for a variable in the expression. For example,

```
solve((sqrt(x)-1)/(sqrt(x)+1)=(x-2*sqrt(x)+1)/(x-1),x)
```

returns *true*, indicating that the two expressions are equal.

(Credit for domain constraints method to Glenn E. Fisher; solve() method to Bhuvanesh Bhatt)