

# equations for natdiv

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```
In[1]:= SetDirectory["1:"]; << goedel91.10a; << tools.m

:Package Title: goedel91.10a      2007 March 10 at 11:05 p.m.

It is now: 2007 Mar 11 at 9:14

Loading Simplification Rules

TOOLS.M                          Revised 2007 March 3

weightlimit = 40
```

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## summary

A rewrite rule is derived that automatically rewrites simple equations involving **natdiv** as equations involving multiplication.

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## derivation

Theorem.

```
In[3]:= equiv[equal[x, natdiv[y, z]], or[and[equal[v, x], not[member[pair[z, y], DIV]]],
and[equal[0, x], equal[0, y], equal[0, z]],
and[equal[0, x], equal[0, y], member[z, omega]], and[equal[y, natmul[x, z]],
member[x, omega], member[z, omega], not[equal[0, z]]]] // not // not

Out[3]= True

In[5]:= equal[x_, natdiv[y_, z_]] :=
or[and[equal[v, x], not[member[pair[z, y], DIV]]], and[equal[0, x],
equal[0, y], equal[0, z]], and[equal[0, x], equal[0, y], member[z, omega]],
and[equal[y, natmul[x, z]], member[x, omega], member[z, omega], not[equal[0, z]]]]
```

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## examples

An example involving a specific number:

```
In[6]:= equal[natdiv[x, y], succ[set[0]]]

Out[6]= and[equal[x, natadd[y, y]], member[y, omega], not[equal[0, y]]]
```

An example involving **nat** wrappers:

```
In[7]:= equal[nat[x], natdiv[nat[y], nat[z]]]
```

```
Out[7]= or[and[equal[0, nat[x]], equal[0, nat[y]]],  
and[equal[nat[y], natmul[nat[x], nat[z]]], not[equal[0, nat[z]]]]]
```

A more complicated example: (equality of floored divisions)

```
In[8]:= equal[natdiv[natsub[nat[x], natmod[nat[x], nat[y]]], nat[y]],  
natdiv[natsub[nat[z], natmod[nat[z], nat[y]]], nat[y]]]
```

```
Out[8]= or[and[member[nat[x], nat[y]], member[nat[z], nat[y]]], equal[0, nat[y]],  
equal[natsub[nat[x], natmod[nat[x], nat[y]]], natsub[nat[z], natmod[nat[z], nat[y]]]]]
```