

Simple arithmetic in Lean

It can be quite tricky to manipulate formulas in Lean. This cheat sheet should give you an overview of the most important cases.

Got	Want	Tactic	What is the rule?
$a+b$	$b+a$	<code>rw add_comm</code>	commutativity
$a+b+c$	$a+(b+c)$	<code>rw add_assoc</code>	associativity
$a+b+c$	$a+c+b$	<code>rw add_assoc</code> <code>rw add_comm b c</code> <code>rw \! add_assoc</code>	higher commutativity
$a-b$	$a+(-b)$	<code>rw sub_eq_add_neg</code>	subtraction = negative addition
$a-a$	0	<code>rw sub_self</code>	number - itself = 0
$a-b$	$(-b) + a$	<code>rw sub_eq_add_neg</code> <code>rw add_comm</code>	negative commutativity
$a-b-c$	$a-(b+c)$	<code>rw sub_sub</code>	negative associativity
$a-b+c$	$a-(b-c)$	<code>rw sub_add</code>	negative associativity
$a+b-c$	$a+(b-c)$	<code>rw add_sub</code>	negative associativity
$(-(-a))$	a	<code>rw neg_neg</code>	negative negative = positive
$a*b$	$b*a$	<code>rw mul_comm</code>	commutativity
$a*b*c$	$a*(b*c)$	<code>rw mul_assoc</code>	associativity
$a*b*c$	$a*c*b$	<code>rw mul_assoc</code> <code>rw mul_comm b c</code> <code>rw \! mul_assoc</code>	higher commutativity
a/b	$a*b^{-1}$	<code>rw div_eq_mul_inv</code>	division = inverse multiplication
$a*a^{-1}$	1	<code>rw mul_inv_cancel</code> (you also need to prove that $a \neq 0$)	number * inverse = 1
$(a*b)^{-1}$	$a^{-1} * b^{-1}$	<code>rw mul_inv</code>	
There is also stuff like <code>div_div</code> , <code>div_mul</code> and <code>mul_div</code> , but I recommend you always work with inverses			
$(a^{-1})^{-1}$	a	<code>rw inv_inv</code>	inv inv = number
$a*(b+c)$	$a*b + a*c$	<code>rw mul_add</code>	distribuity
$(a+b)*c$	$a*c + b*c$	<code>rw add_mul</code>	distribuity
$a*(b-c)$	$a*b - a*c$	<code>rw mul_sub</code>	distribuity
$(a-b)*c$	$a*c - b*c$	<code>rw sub_mul</code>	distribuity
$a-b=0$	$a=b$	<code>rw sub_eq_zero</code>	when is subtraction zero?
$a*b=0$	$a=0$ \or $b=0$	<code>rw mul_eq_zero</code>	when is multiplication zero?
$(a+b)^2$	$a^2 + 2*a*b + b^2$	<code>rw add_sq</code>	binomial formulas
$(a-b)^2$	$a^2 - 2*a*b + b^2$	<code>rw sub_sq</code>	binomial formulas
$a^2 - b^2$	$(a+b)*(a-b)$	<code>rw sq_sub_sq</code>	binomial formulas