Matita

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```
definition defactorize : nat_fact_all \to nat \def
\lambda f : nat_fact_all.
match f with
[ nfa_zero \Rightarrow O
| nfa_one \Rightarrow (S O)
| (nfa_proper g) \Rightarrow defactorize_aux g O].

theorem lt_O_defactorize_aux:
  \forall f:nat_fact.\forall i:nat.
  O < defactorize_aux f i.
intro; elim f;
[ simplify; unfold lt;
  rewrite > times_n_SO;
  apply le_times;
  [ change with (O < \pi\sub i);
    apply lt_O_nth_prime_n;
  | change with (O < exp (\pi\sub i) n);
    apply lt_O_exp;
    apply lt_O_nth_prime_n; ]
| simplify; unfold lt;
  rewrite > times_n_SO;
  apply le_times;
  [ change with (O < exp (\pi\sub i) n);
    apply lt_O_exp;
    apply lt_O_nth_prime_n;
  | change with (O < defactorize_aux n1 (S i));
    apply H; ] ]
qed.
```

factorization.ma * | outline

?15 | ?13

f:nat_fact
n:nat
i:nat

$S\ O \cdot S\ O \leq \pi_i \cdot (\pi_i)^n$

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about:proof

Locate

Proof lt_O_defactorize_aux
Thesis:
$\forall f$:nat_fact.$\forall i$:nat.$O <$defactorize_aux $f\ i$
Conjectures:33
{...} ⊢15:$S\ O \cdot S\ O \leq \pi_i \cdot (\pi_i)^n$
{...} ⊢13:$O <$defactorize_aux (nf_cons n n1) i
(lt_O_defactorize_aux)
Assume f:nat_fact
we proceed by induction on f
to prove Πi:nat.$O <$defactorize_aux $f\ i$
Case nf_last n:nat ⇒
the thesis becomes
Πi:nat.$O <$defactorize_aux (nf_last n) i
Assume i:nat
(H)
Consider ?15$i; n; f$
(H)
by (times_n_SO _)
we conclude $S\ O = S\ O \cdot S\ O$
by (eq_elim_r _ _ _ H _ H)
we conclude $S\ O \leq \pi_i \cdot (\pi_i)^n$
that is equivalent to
$O <$defactorize_aux (nf_last n) i

rary/nat/