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Note Title

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Functional forms (higher-order functions)  
(combining forms)

⊙ composition

$$f \circ g: x \equiv f(g(x))$$

[...] construction

$[f_1, f_2, \dots, f_n] : X \equiv$

$\langle f_1 : X, f_2 : X, \dots, f_n : X \rangle$

Insert (similar to Haskell's fold)

$!f : X \equiv$  if  $x$  is  $\langle x_1 \rangle$  then  $x$ ,  $\leftarrow$  <sup>back</sup> see  
else if  $x$  is  $\langle x_1, x_2, \dots, x_n \rangle$  and  $n \geq 2$   
 $f : \langle x, f : \langle x_2, f : \langle x_3, \dots \rangle \dots \rangle$

(more formally :  $f : \langle x_1, !f : \langle x_2, \dots, x_n \rangle \rangle$  )

Example: !+

$$!+ : \langle 1 \rangle \equiv 1$$

$$!+ : \langle 1 \ 2 \ 3 \rangle \equiv + : \langle 1, + : \langle 2, \underbrace{!+ : \langle 3 \rangle} \rangle \rangle \equiv$$

$$\equiv + : \langle 1, + : \langle 2, 3 \rangle \rangle \equiv + : \langle 1, 5 \rangle \equiv 6$$

$$!+ : \langle 1 \ 2 \ 3 \rangle \equiv + : \langle 1, !+ : \langle 2 \ 3 \rangle \rangle \equiv$$

$$\equiv + : \langle 1, + : \langle 2, !+ : \langle 3 \rangle \rangle \rangle \equiv$$

$$\equiv + : \langle 1, + : \langle 2, 3 \rangle \rangle \equiv + : \langle 1, 5 \rangle \equiv 6$$

% Constant    % k is defined as

$$\% k : x \equiv k$$

& Apply to all

& f : x.  $\equiv$  if x is nil (the empty sequence) then nil  
else if x is  $\langle x_1, \dots, x_n \rangle$  ( $n \geq 1$ ), then  
 $\langle f : x_1, \dots, f : x_n \rangle$

Example: factorial

{ iszero = @ [id, %] }

{ subone = - @ [id, %] }

{ fact (iszero → % 1; \* @ [id, fact @ sub1]) }