

```
if  $l = \text{nil}$  then
   $m := \text{nil}$ ;
else begin
   $a := l.1$ ;
   $m := \text{cons}(a, \text{nil})$ ;
   $i := l.2$ ;
   $j := m$ ;
  while  $i \neq \text{nil}$  do begin
     $a := i.1$ ;
     $t := \text{cons}(a, \text{nil})$ ;
     $j.2 := t$ ;
     $i := i.2$ ;
     $j := t$ ;
  end
end
end
```

```

{ $l \xrightarrow{\alpha} \text{nil}$ }
if  $l = \text{nil}$  then
   $m := \text{nil};$ 
else begin
   $a := l.1;$ 
   $m := \text{cons}(a, \text{nil});$ 
   $i := l.2;$ 
   $j := m;$ 
  while
     $i \neq \text{nil}$ 
  do begin
     $a := i.1;$ 
     $t := \text{cons}(a, \text{nil});$ 
     $j.2 := t;$ 
     $i := i.2;$ 
     $j := t;$ 
  end
end
{ $l \xrightarrow{\alpha} \text{nil} \star m \xrightarrow{\alpha} \text{nil}$ }

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{l  $\xrightarrow{\alpha}$  nil}
if  $l = \text{nil}$  then { $l \xrightarrow{\alpha} \text{nil} \wedge \alpha = \epsilon$ }
   $m := \text{nil}$ ; { $l \xrightarrow{\alpha} \text{nil} \wedge \alpha = \epsilon \wedge m \xrightarrow{\alpha} \text{nil}$ }
else begin
   $a := l.1$ ;
   $m := \text{cons}(a, \text{nil})$ ;
   $i := l.2$ ;
   $j := m$ ;
  while
     $i \neq \text{nil}$ 
  do begin
     $a := i.1$ ;
     $t := \text{cons}(a, \text{nil})$ ;
     $j.2 := t$ ;
     $i := i.2$ ;
     $j := t$ ;
  end
end
{l  $\xrightarrow{\alpha}$  nil  $\star$   $m \xrightarrow{\alpha}$  nil}

```

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{l  $\xrightarrow{\alpha}$  nil}
if  $l = \text{nil}$  then
   $m := \text{nil};$ 
else begin { $l \xrightarrow{\alpha} \text{nil} \wedge \alpha \neq \epsilon$ }
   $a := l.1;$ 
   $m := \text{cons}(a, \text{nil});$ 
   $i := l.2;$ 
   $j := m;$ 
  while
     $i \neq \text{nil}$ 
  do begin
     $a := i.1;$ 
     $t := \text{cons}(a, \text{nil});$ 
     $j.2 := t;$ 
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  end
end
{l  $\xrightarrow{\alpha}$  nil  $\star$   $m \xrightarrow{\alpha}$  nil}

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```

{ $l \xrightarrow{\alpha} \text{nil}$ }
if  $l = \text{nil}$  then
   $m := \text{nil};$ 
else begin { $\exists x, \alpha', l'. \alpha = x\alpha' \wedge l \xrightarrow{x} l' \xrightarrow{\alpha'} \text{nil}$ }
   $a := l.1;$ 
   $m := \text{cons}(a, \text{nil});$ 
   $i := l.2;$ 
   $j := m;$ 
  while
     $i \neq \text{nil}$ 
  do begin
     $a := i.1;$ 
     $t := \text{cons}(a, \text{nil});$ 
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  end
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{ $l \xrightarrow{\alpha} \text{nil} \star m \xrightarrow{\alpha} \text{nil}$ }

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{l  $\xrightarrow{\alpha}$  nil}
if  $l = \text{nil}$  then
   $m := \text{nil}$ ;
else begin  $\{\exists x, \alpha', l'. \alpha = x\alpha' \wedge l \xrightarrow{x} l' \xrightarrow{\alpha'} \text{nil}\}$ 
   $a := l.1$ ;            $\{l \xrightarrow{a} l' \xrightarrow{\alpha'} \text{nil}\}$ 
   $m := \text{cons}(a, \text{nil})$ ;  $\{l \xrightarrow{a} l' \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{a} \text{nil}\}$ 
   $i := l.2$ ;           $\{l \xrightarrow{a} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{a} \text{nil}\}$ 
   $j := m$ ;            $\{l \xrightarrow{a} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\epsilon} j \xrightarrow{a} \text{nil}\}$ 
  while
     $i \neq \text{nil}$ 
  do begin
     $a := i.1$ ;
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end
 $\{l \xrightarrow{\alpha} \text{nil} \star m \xrightarrow{\alpha} \text{nil}\}$ 

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if  $l = \text{nil}$  then
   $m := \text{nil}$ ;
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   $a := l.1$ ;  $\{l \xrightarrow{a} l' \xrightarrow{\alpha'} \text{nil}\}$ 
   $m := \text{cons}(a, \text{nil})$ ;  $\{l \xrightarrow{a} l' \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{a} \text{nil}\}$ 
   $i := l.2$ ;  $\{l \xrightarrow{a} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{a} \text{nil}\}$ 
   $j := m$ ;  $\{l \xrightarrow{a} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\epsilon} j \xrightarrow{a} \text{nil}\}$ 
  while  $\{\exists \beta, x, \alpha'. \alpha = \beta x \alpha' \wedge l \xrightarrow{\beta x} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}\}$ 
     $i \neq \text{nil}$ 
  do begin
     $a := i.1$ ;
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   $j := m;$ 
  while { $\exists \beta, x, \alpha'. \alpha = \beta x \alpha' \wedge l \xrightarrow{\beta x} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
     $i \neq \text{nil}$ 
  do begin
     $a := i.1;$ 
     $t := \text{cons}(a, \text{nil});$ 
     $j.2 := t;$ 
     $i := i.2;$ 
     $j := t;$ 
  end
  { $\exists \beta, x, \alpha'. \alpha = \beta x \alpha' \wedge \alpha' = \epsilon \wedge l \xrightarrow{\beta x} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
  { $\exists \beta, x. \alpha = \beta x \wedge l \xrightarrow{\beta x} \text{nil} \star m \xrightarrow{\beta x} \text{nil}$ }
end
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  while { $\exists \beta, x, \alpha'. \alpha = \beta x \alpha' \wedge l \xrightarrow{\beta x} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
     $i \neq \text{nil}$ 
  do begin { $\alpha' \neq \epsilon$ }
     $a := i.1;$ 
     $t := \text{cons}(a, \text{nil});$ 
     $j.2 := t;$ 
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  while { $\exists \beta, x, \alpha'. \alpha = \beta x \alpha' \wedge l \xrightarrow{\beta x} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
     $i \neq \text{nil}$ 
  do begin { $\exists y, \alpha''. \alpha' = y \alpha''$ }
     $a := i.1;$ 
     $t := \text{cons}(a, \text{nil});$ 
     $j.2 := t;$ 
     $i := i.2;$ 
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   $j := m$ ;
  while { $\exists \beta, x, \alpha'. \alpha = \beta x \alpha' \wedge l \xrightarrow{\beta x} i \xrightarrow{\alpha'} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
     $i \neq \text{nil}$ 
  do begin { $\exists \beta, x, y, \alpha'', i'. \alpha = \beta x y \alpha'' \wedge l \xrightarrow{\beta x} i \xrightarrow{y} i' \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
     $a := i.1$ ;      { $l \xrightarrow{\beta x} i \xrightarrow{a} i' \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil}$ }
     $t := \text{cons}(a, \text{nil})$ ;  { $l \xrightarrow{\beta x} i \xrightarrow{a} i' \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} \text{nil} \star t \xrightarrow{a} \text{nil}$ }
     $j.2 := t$ ;      { $l \xrightarrow{\beta x} i \xrightarrow{a} i' \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} t \xrightarrow{a} \text{nil}$ }
     $i := i.2$ ;      { $l \xrightarrow{\beta x a} i \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\beta} j \xrightarrow{x} t \xrightarrow{a} \text{nil}$ }
     $j := t$ ;      { $l \xrightarrow{\beta x a} i \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\beta x} j \xrightarrow{a} \text{nil}$ }
    { $\exists \gamma, a, \alpha''. \alpha = \gamma a \alpha'' \wedge l \xrightarrow{\gamma a} i \xrightarrow{\alpha''} \text{nil} \star m \xrightarrow{\gamma} j \xrightarrow{a} \text{nil}$ }
  end
end
{ $l \xrightarrow{\alpha} \text{nil} \star m \xrightarrow{\alpha} \text{nil}$ }

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