## **Derivation Trees**

```
· R1: rev([],[]).
· R2: rev([X|Xs],Ys) :-
      rev(Xs,Rs), append(Rs, [X], Ys).
· A1: append([], Ys, Ys).
· A2: append([X|Xs],Ys,[X|Zs]) :-
      append(Xs,Ys,Zs).
```

rev([1,2], Rs)

```
rev([1,2], Rs)
R1
Fail ([] = [1,2])
```

rev([1,2], Rs)

R1

R2

$$X = 1, Xs = [2]$$

Fail ([] = [1,2]) rev([2], Rs),
append(Rs1,[1],Rs)

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2]) rev([2], Rs),
 append(Rs1,[1],Rs)

R1

Fail ([] = [2])
```

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2])

R1

R2

R2

R2

R2

Fail ([] = [2])

X = 2, Xs = []

rev([], Rs2),

append(Rs2,[2],Rs1)

append(Rs1,[1],Rs)
```

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2])

R1

R2

Fail ([] = [2])

R2

Fail ([] = [2])

X = 2, Xs = []

rev([], Rs2),
append(Rs2,[2],Rs1)
append(Rs1,[1],Rs)

R1

Yay ([] = [])
```

```
rev([1,2], Rs)
                       R2
      R1
                         X = 1, Xs = [2]
                     rev([2], Rs),
Fail ([] = [1,2])
                      append(Rs1,[1],Rs)
                                  X = 2, Xs = [], Rs2 = []
       Fail ([] = [2])
                         rev([], Rs2),
                         append(Rs2,[2],Rs1)
                         append(Rs1,[1],Rs)
          Yay ([] = [])
                               Fail ([X|Xs] = [])
```

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2])

R1

R2

R2

R2

Fail ([] = [2])

R2

X = 2, Xs = [], Rs2 = []

rev([], Rs2),

append([],[2],Rs1)
append(Rs1,[1],Rs)
```

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2])

R1

R2

R2

R2

R3

R2

Fail ([] = [2])

R2

X = 2, Xs = [], Rs2 = [], Rs1 = [2]

R2

Fail ([] = [2])

R3

R4

R2

Fail ([] = [2])

R51

A1

A1

Yay ([] = [])
```

```
rev([1,2], Rs)
      R1
                         X = 1, Xs = [2]
                     rev([2], Rs),
Fail ([] = [1,2])
                     append(Rs1,[1],Rs)
                                  X = 2, Xs = [], Rs2 = [], Rs1 = [2]
       Fail ([] = [2])
                         rev([], Rs2),
                         append([],[2],Rs1)
                         append(Rs1,[1],Rs)
          Yay ([] = [])
                              Fail ([X|Xs] = [])
```

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2]) rev([2], Rs),
    append(Rs1,[1],Rs)

R1

R2

R2

R2

X = 1, Xs = [2]

X = 1, Xs = [2]
```

```
rev([1,2], Rs)

R1

R2

X = 1, Xs = [2]

Fail ([] = [1,2])

R1

R2

R2

Fail ([] = [2])

R2

X = 2, Xs = [], Rs2 = [], Rs1 = [2]

rev([], Rs2),
append([],[2],Rs1)
append([2],[1],Rs)

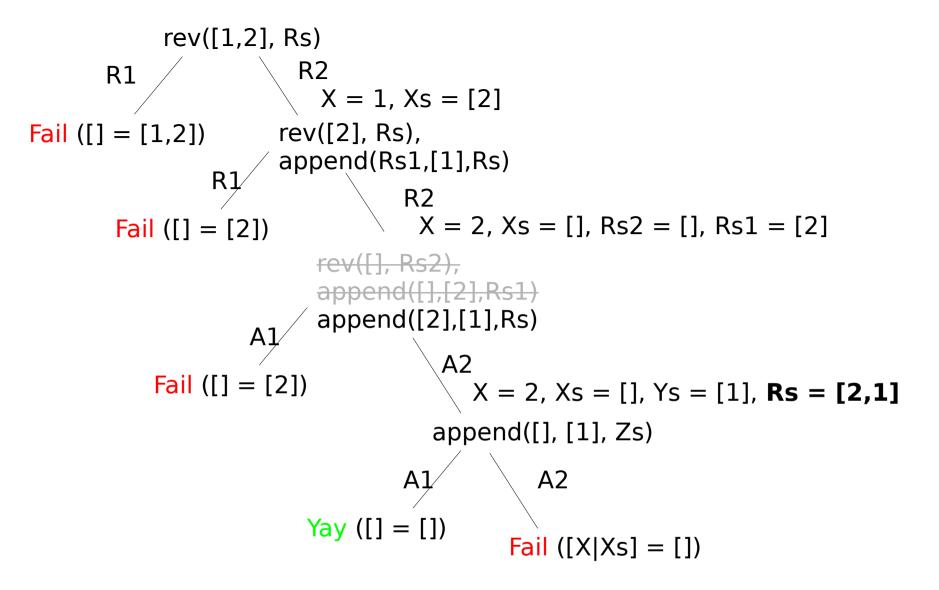
Fail ([] = [2])
```

```
rev([1,2], Rs)
      R1
                         X = 1, Xs = [2]
                     rev([2], Rs),
Fail ([] = [1,2])
                      append(Rs1,[1],Rs)
                                  X^2 = 2, X^2 = [], X^2 = [], X^3 = []
       Fail ([] = [2])
                         append([2],[1],Rs)
           Fail ([] = [2])
                                      X = 2, Xs = [], Ys = [1], Rs = [X|Zs]
                                   append([], [1], Zs)
```

```
rev([1,2], Rs)
      R1
                         X = 1, Xs = [2]
                     rev([2], Rs),
Fail ([] = [1,2])
                      append(Rs1,[1],Rs)
                                  X = 2, Xs = [], Rs2 = [], Rs1 = [2]
       Fail ([] = [2])
                         append([2],[1],Rs)
           Fail ([] = [2])
                                       X = 2, Xs = [], Ys = [1], Rs = [X|Zs], Zs = [1]
                                   append([], [1], Zs)
                        Yay ([] = [])
```

```
rev([1,2], Rs)
      R1
                         X = 1, Xs = [2]
                     rev([2], Rs),
Fail ([] = [1,2])
                      append(Rs1,[1],Rs)
                                  X = 2, Xs = [], Rs2 = [], Rs1 = [2]
       Fail ([] = [2])
                         append([2],[1],Rs)
           Fail ([] = [2])
                                      X = 2, Xs = [], Ys = [1], Rs = [2,1]
                                   append([], [1], Zs)
                        Yay ([] = [])
```

$$Rs = [2,1]$$



$$Rs = [2,1]$$

```
rev([1,2], Rs)
                         R2
       R1
                           X = 1, Xs = [2]
                       rev([2], Rs),
Fail ([] = [1,2])
                       append(Rs1,[1],Rs)
                 R1
                                   R2
                                                      <mark>K</mark>s2 = [], Rs1 = [2]
        Fail ([] = [2])
                           ar
                    A1
           Fail ([]
                                          X = 2, Xs = [], Ys = [1], Rs = [2,1]
                                      append([], [1], Zs)
                                                A2
                          Yay ([] = [])
                                             Fail ([X|Xs] = [])
       Rs = [2,1]
```