

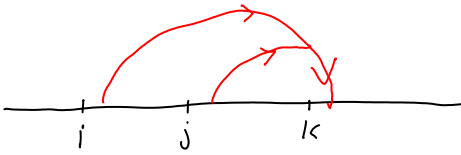
## Debugging 2

September-17-08  
11:16 AM

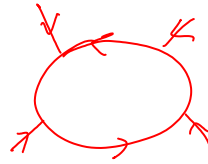
No issues

```
RelationsIn[gc_GC, red_] := ReplaceList[
red*(Times @@ Select[gc, (Intersection[List @@ #, List @@ red] != {}) &]), {}]
```

Conventions:



The meaning of  $\text{RedAr}[i, j, k]$   
Note that if  $i=k$  or if  $j=k$ ,  
the head is to the right of  
the tail.

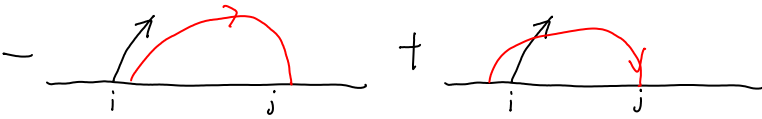


The meaning of  
 $x^2 \text{RedW}[]$   
(the wheel spins  
counterclockwise)

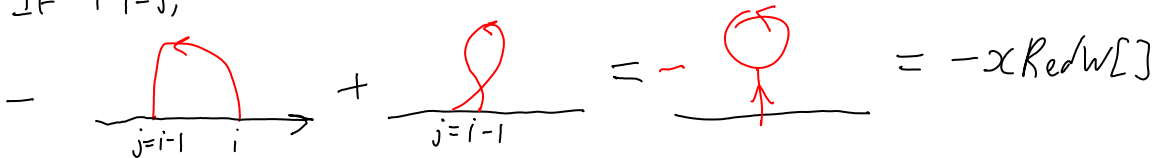
```
(* Short red arrows are central: *)
RedAr[i_, j_] /; i > 0 >> -red + RedAr[i - 1, i - 1],
```

No issues

```
(* Tails commute for RedAr: *)
RedAr[i_, j_] Ar[k_, l_] >> -red + RedAr[i - 1, j] + If[i - 1 == j, -x RedW[], 0],
```



IF  $i-1=j$ ,



No issues

```
(* Commuting a RedAr tail across an Ar head *)
RedAr[i_, j_] Ar[k_, l_] >> -red + RedAr[i - 1, j] + (X^s - 1)/x RedY[k, i, j] + If[i - 1 == j, -x RedW[], 0],
```

not red

```
(* Commuting the head of a RedAr with the head of an Ar *)
(* RedAr[i_, j_] Ar[k_, l_] >> -red + RedAr[i, j - 1] + (X^s - 1)/x RedY[k, i, j] + If[i == j, -x RedW[], 0], *)
(* The anti-symmetry of RedY: *)
RedY[i_, j_, k_] >> red + RedY[j, i, k],
(* Tails commute for RedY: *)
RedY[i_, j_, k_] Ar[l_, s_] >> -red + RedY[i - 1, j, k] + If[i - 1 == k, x^2 RedW[], 0],
RedY[i_, j_, k_] Ar[j_, l_] >> -red + RedY[i, j - 1, k] + If[j - 1 == k, -x^2 RedW[], 0],
(* Commuting a RedY tail across an Ar head *)
RedY[i_, j_, k_] Ar[l_, s_] >> -red + RedY[i, j - 1, k] - (X^s - 1) RedY[l, j, k] + If[j - 1 == k, -x^2 RedW[], 0]
}
```