Applying single rotation

- Note that application of an right single rotation results in z being pushed down by one unit from the root whereas x and y are pulled up by one unit.
- This implies the subtrees T_3 and T_4, i.e., the subtree with x as root is pulled up by 1 unit. This tree becomes closer to root as a result of rotation.
- Similarly the subtree T_1 is pushed down. It drifts away by 1 unit from the root.
- But T_2 remains unaffected by the rotation.
- Assuming the original tree to be height balanced before an insertion which necessitiates the rotation, will be applicable if the insertion is done into subtree rooted at x.

Applying single rotation

We can claim that the balance factors: $BF(z) = -1$, $BF(x) = 0$ and $BF(y) = 0$.

Since z is the root of the smallest subtree which became unbalanced, $BF(y) \neq -1$ and $BF(x) \neq -1$.

Let $BF(y) = 1$. Then $H(T_y) = H(T_2) + 1$. An insertion in T_x incrments $H(T_x)$, but $H(T_y)$. Thus, there will be no change in $BF(z)$ due to an insertion in T_3 or T_4. Since this a contradiction, it means $BF(y) = 0$.

Let $BF(x) = 1$. Then $H(T_x) = H(T_3) + 1$. Thus, an imbalance cannot occur if insertion is done to T_4. But if insertion is in T_3 then x becomes the root of the smallest tree where imbalance occurs due to an insertion. A contradiction.