To solve an polynomial inequality

$$(\cdots\cdot)(\cdots\cdot)\ \cdots\ (\cdots\cdot) > 0$$
or
$$(\cdots\cdot)(\cdots\cdot)\ \cdots\ (\cdots\cdot) < 0$$
or
$$(\cdots\cdot)(\cdots\cdot)\ \cdots\ (\cdots\cdot) \geq 0$$
or
$$(\cdots\cdot)(\cdots\cdot)\ \cdots\ (\cdots\cdot) \leq 0$$

- Note that all the polynomial's zeros (or roots) will divide the real number line into several regions (intervals), and

- The polynomial (·····)(·····) ···· (·····) will either completely positive or completely negative in each region (interval). This is because the polynomial can change its algebraic sign without going through any of its zeros (roots).

- Therefore, to solve (·····)(·····) ···· (·····) > 0, we only have to find out in which region the polynomial is positive. Similarly, to solve (·····)(·····) ···· (·····) < 0, we only have to find out in which region the polynomial is negative. For the other two cases, we only have to include the all the zeros.

- Since the polynomial will only have one algebraic sign in each region, one can use an arbitrary test point from this region to determine the sign, and thus build a complete <u>sign chart</u> for this polynomial before actually determining the solution.

- A more efficient way is to understand that the sign in the rightmost region will have the same sign as the leading coefficient of this polynomial.

- Next, if all factors (·····) of this polynomial are distinct, the signs in the sing chart will alternate. This is because the polynomial will change sign each time it passes through a zero.

In addition,

- One can extend the alternating feature to all cases when the exponents of all factors are odd!

- Also, the sign will not change around a zero (or root) of the polynomial if the factor producing this zero (or root) has an even exponent!