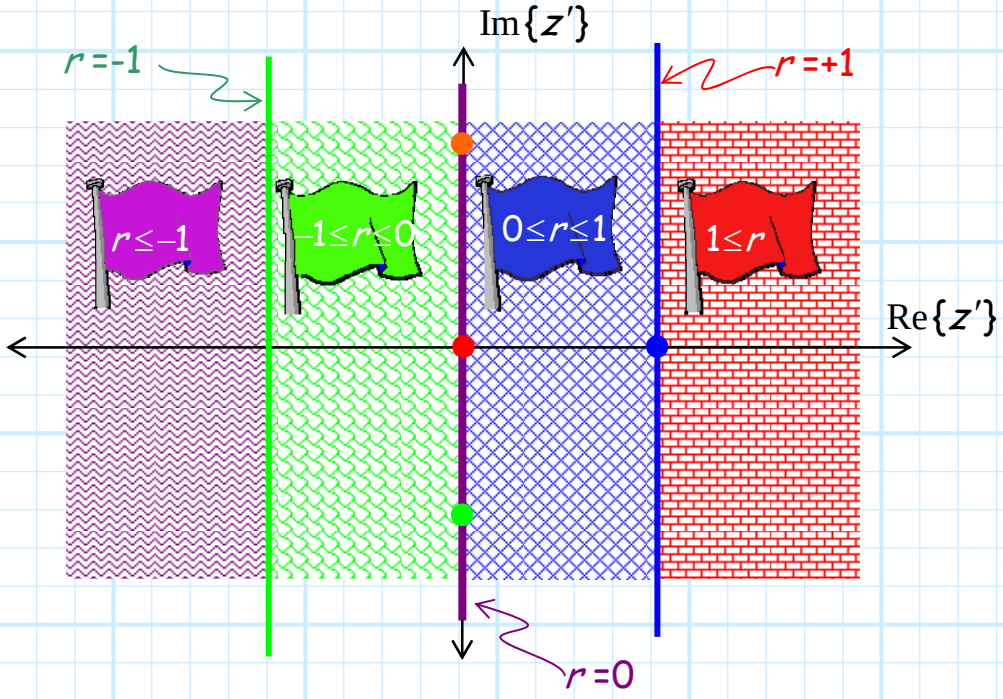
Smith Chart Geography

We have located specific **points** on the complex impedance plane, such as a **short circuit** or a **matched load**.

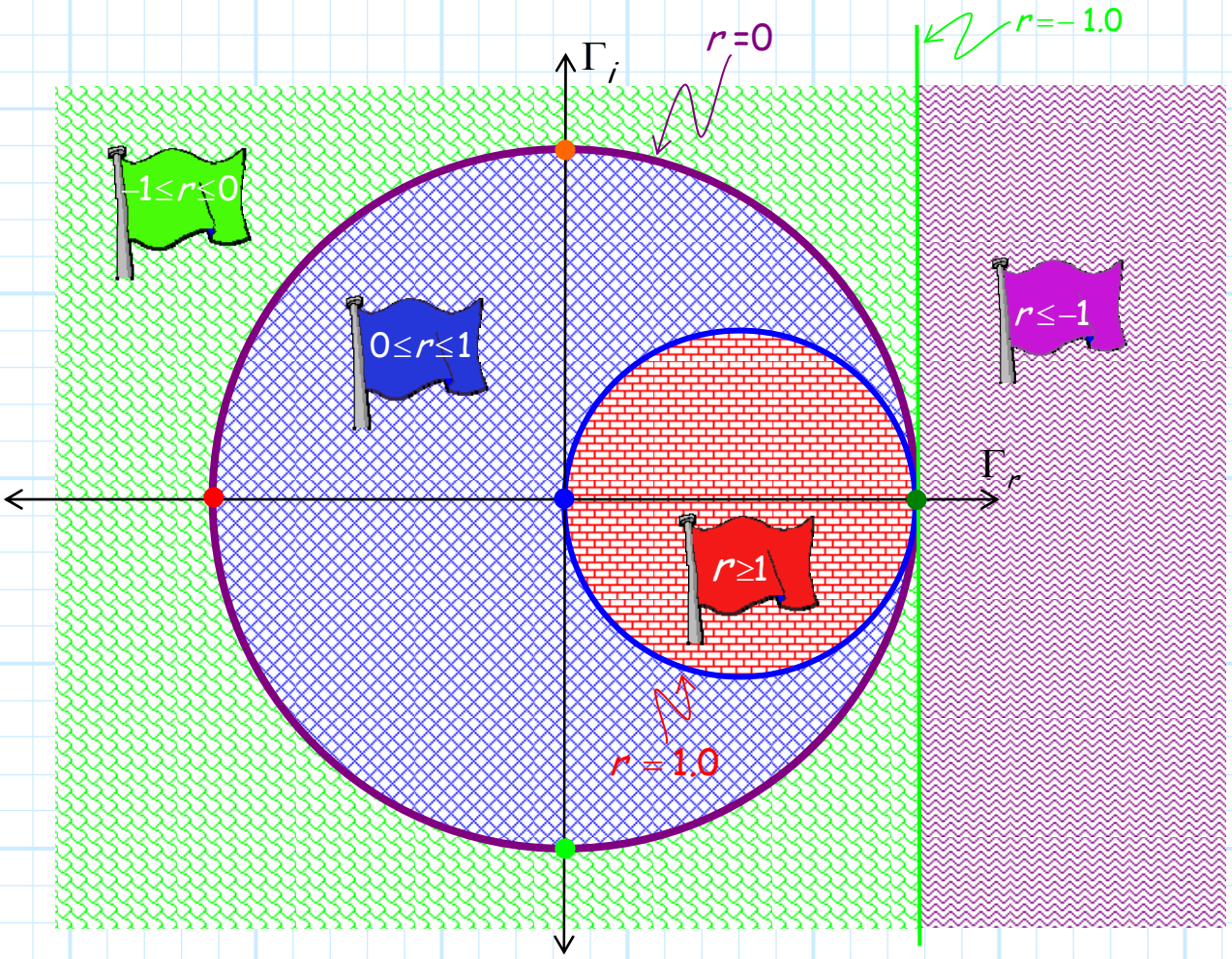
We've also identified **contours**, such as $r=1$ or $x=-2$.

We can likewise identify **whole regions (!)** of the complex **impedance** plane, providing a bit of a **geography lesson** of the complex impedance plane.

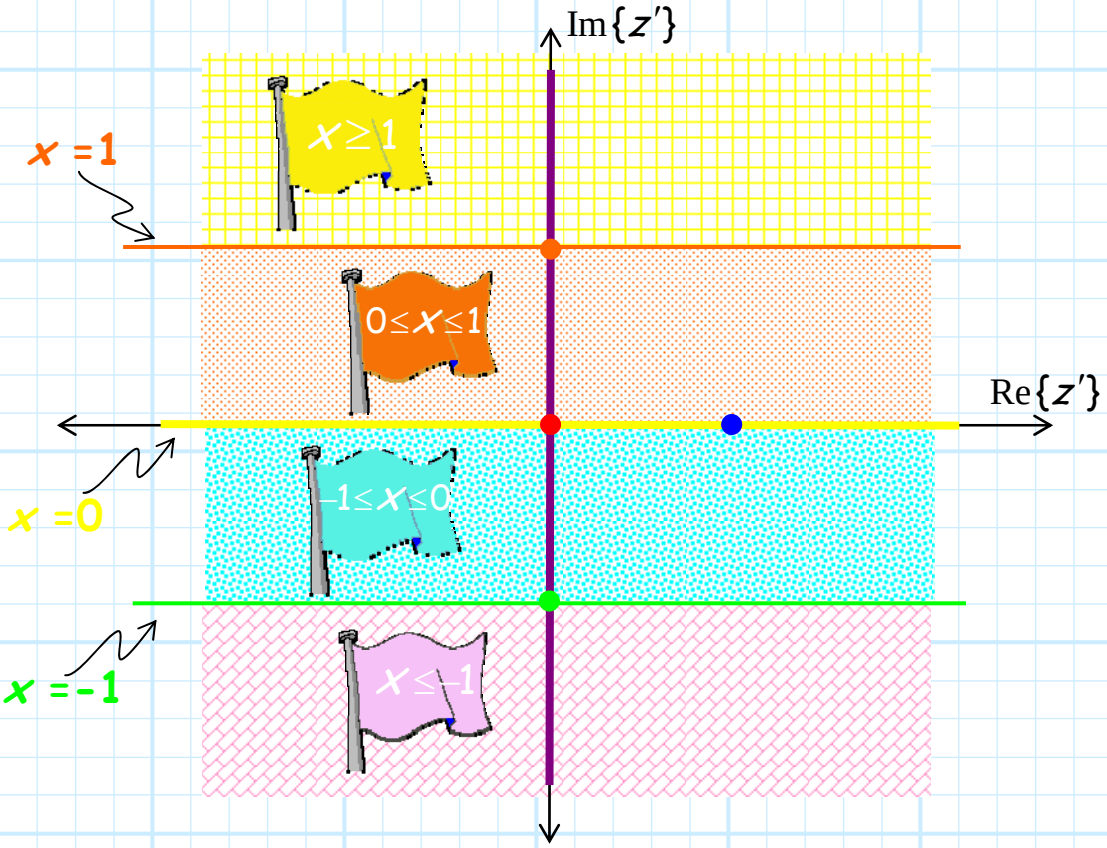
For example, we can divide the complex impedance plane into **four** regions based on normalized **resistance** value r:



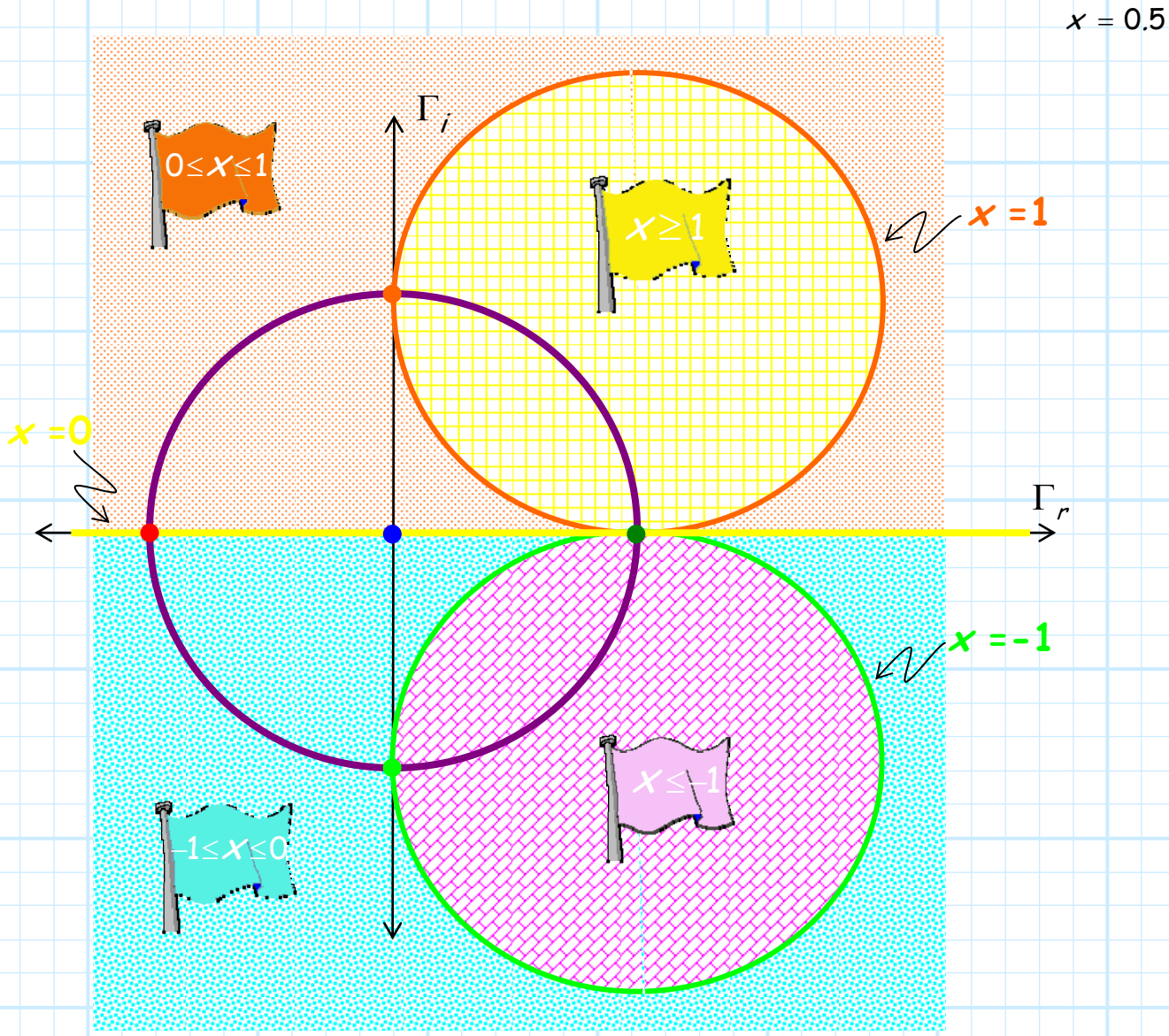
Just like points and contours, these regions of the complex impedance plane can be **mapped** onto the **complex gamma plane**!



Instead of dividing the complex impedance plane into regions based on normalized resistance r, we could divide it based on **normalized reactance** x:



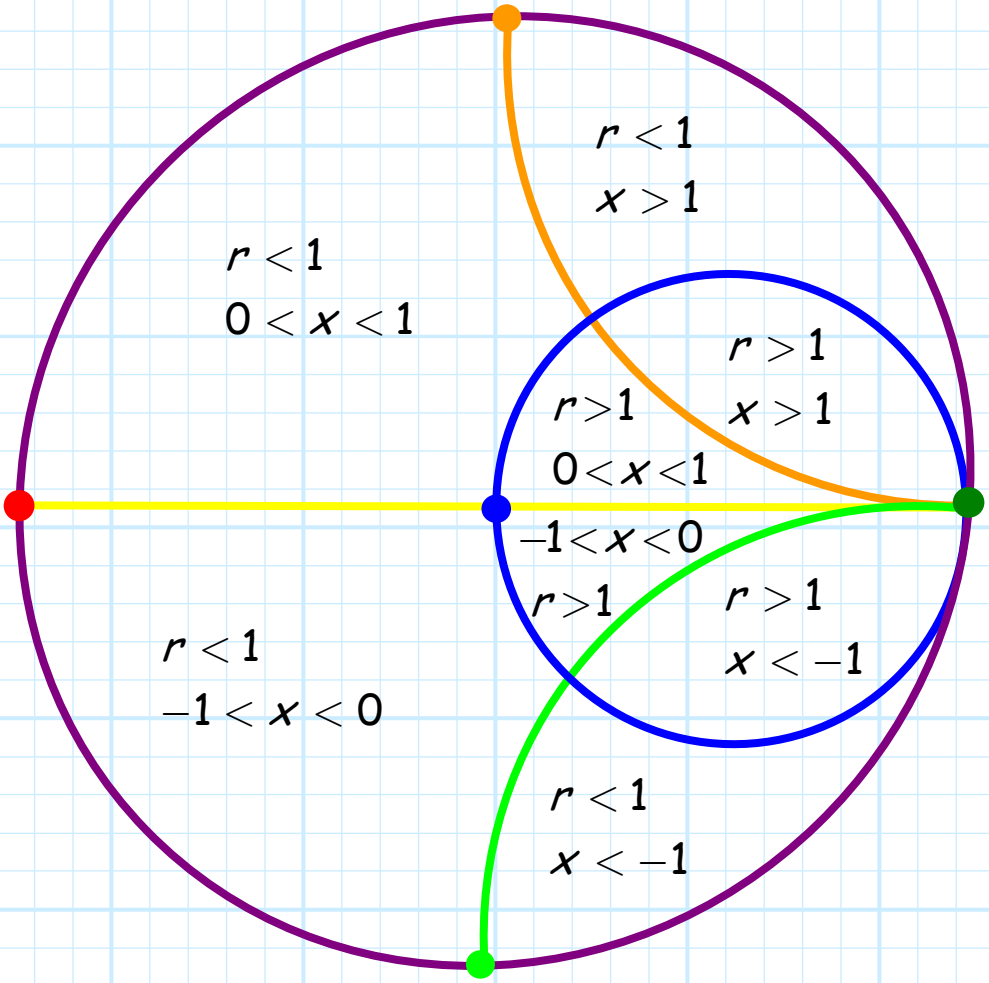
These four regions can likewise be mapped onto the **complex gamma plane**:



Note the four resistance regions and the four reactance regions combine to from **16 separate regions** on the complex impedance and complex gamma planes!

Eight of these sixteen regions lie in the **valid region** (i.e., $r > 0$), while the other eight lie entirely in the invalid region.

Make sure **you** can locate the eight impedance regions on a **Smith Chart**—this understanding of **Smith Chart geography** will help you understand your design and analysis results!


$r < 1$
$x > 1$
$r < 1$
$0 < x < 1$
$r > 1$
$x > 1$
$r > 1$
$0 < x < 1$
$-1 < x < 0$
$r > 1$
$r > 1$
$x < -1$
$r < 1$
$-1 < x < 0$
$r < 1$
$x < -1$