

**Ex:** Plot the poles and zeros of  $F(s)$  in the  $s$  plane.

$$F(s) = \frac{s^2 - 9}{s[(s+1)^2 + 4]}$$

**SOL'N:** The zeros are the roots of the numerator, and the poles are the roots of the denominator:

$$F(s) = \frac{(s+3)(s-3)}{s(s+1+j2)(s+1-j2)}$$

**NOTE:** The roots of the quadratic in the denominator follow from the form in which the denominator was written:

$$(s+a)^2 + \omega^2 = (s+a+j\omega)(s+a-j\omega)$$

We plot the zeros as **o**'s and the poles as **x**'s:

