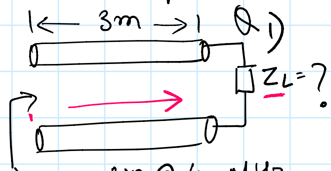
Smith Chart-4

Friday, May 22, 2020 8:21 AM

Example 3:

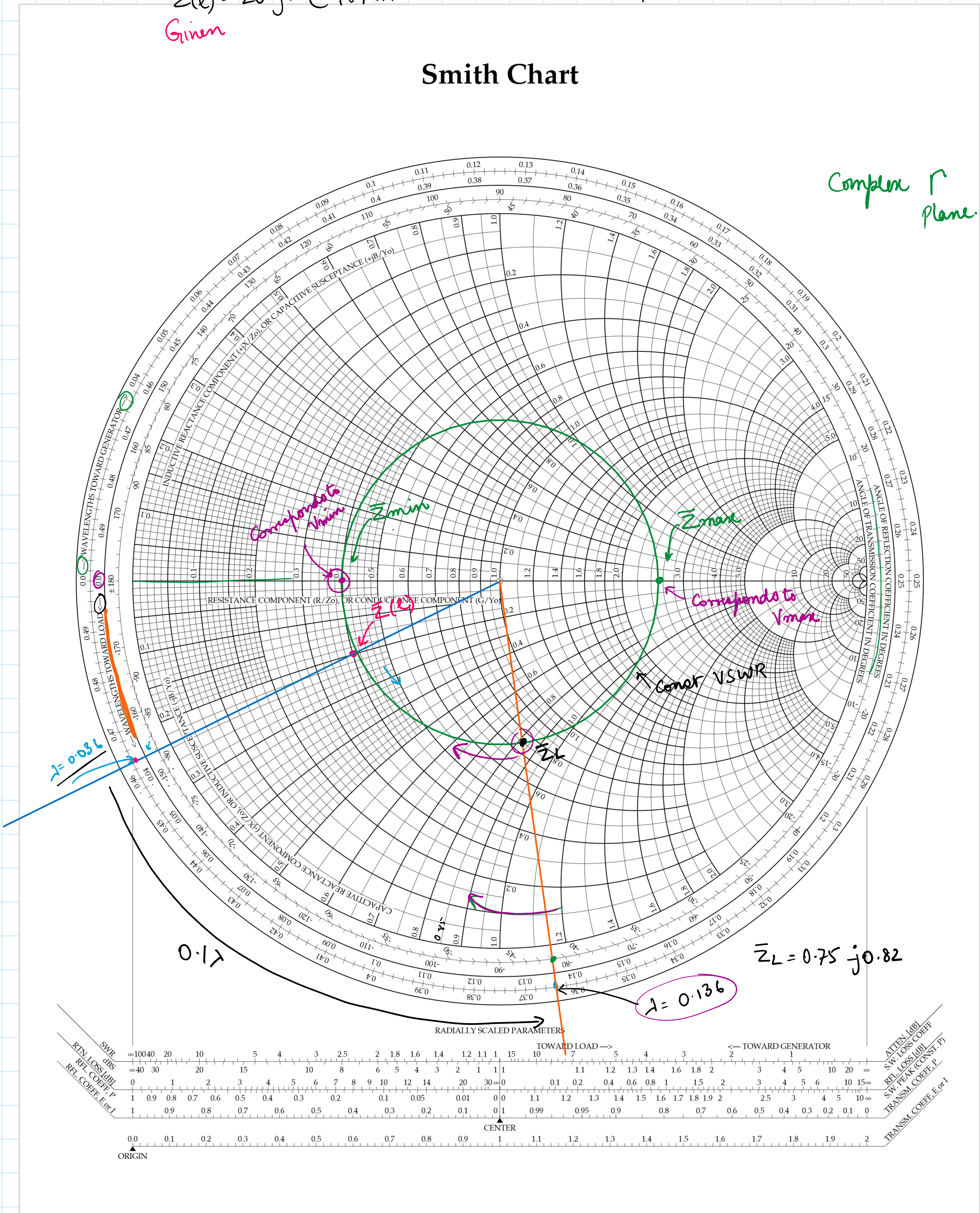


$Z_0 = 50\Omega$

$\epsilon_r = 2.25$

$l = 3m$ (length of the transmission line)

Q 2) Find the position of Vmin in meters from the load.



ORIGIN

Step 1 : Normalize $z(\ell)$ $\bar{z}(\ell) = \frac{20-j10}{50} = 0.4 - j0.2$

Step 2 : Claculate λ (wavelength).

$$\lambda = \frac{v}{f} = \frac{3\times10^8 m/s}{\sqrt{\epsilon_r}} \cdot \frac{1}{40\times10^6} = 5m$$

Electrical length of the Transmission line (in λ) $= \frac{3m}{5m} = 0.6\lambda$

Step 3 : Go counterclockwise on constant VSWR circle by 0.6λ

$$\underline{0.6\lambda} = \underbrace{0.5\lambda}_{2\pi \text{ rotation}} + \underline{0.1\lambda}$$

$2\beta\ell = 2\pi$

$2\frac{2\pi}{\lambda}\ell = 2\pi$

$\ell = \lambda/2$

Step 4 : Draw a line-B from Centre to 0.136λ

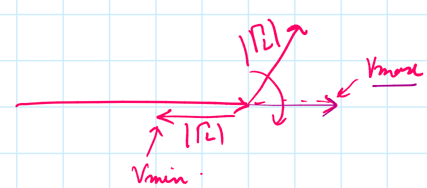
Step 5 : Observe the intersection of line-B & VSWR circle as $\bar{z}_L$

Step 6 : $Z_L = 50(0.75 - j0.82) = 37.5 - j41\ \Omega$

(b) Minimum voltage location from the load.

$V_{min} = V^+(1 - |\Gamma_L|)$

$V_{max} = V^+(1 + |\Gamma_L|)$



Step 7 : Measure distance between $\bar{z}_L$ & Vmin pt in terms of λ

Distance $= 0.136\lambda$

Distance $= 5m \times 0.136 = 0.68\ m$ from the load