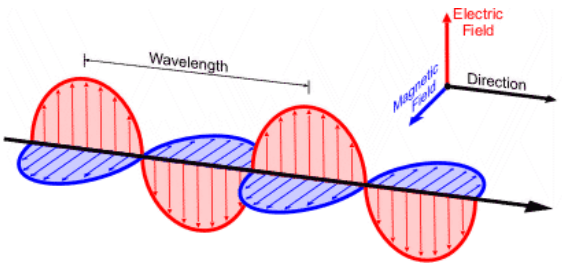
THE UNIVERSITY OF BRITISH COLUMBIA
Department of Electrical & Computer Engineering

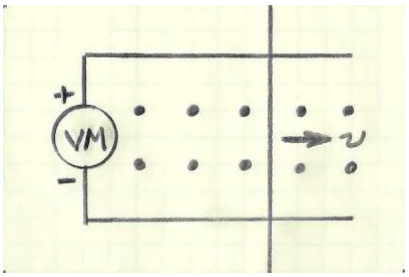
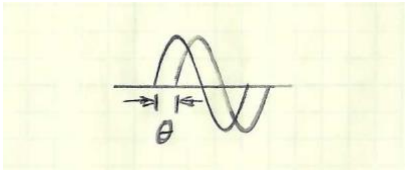
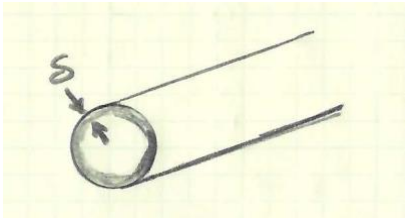
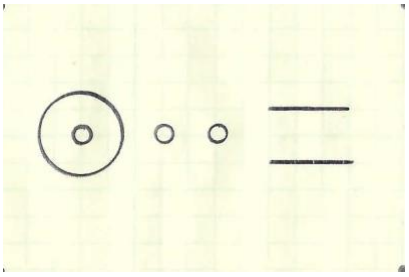
ELEC 311 – Electromagnetic Fields and Waves

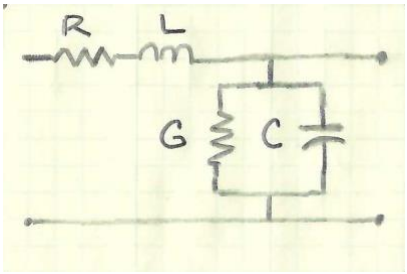
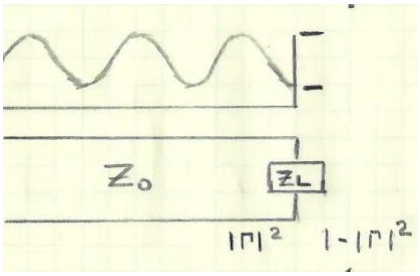
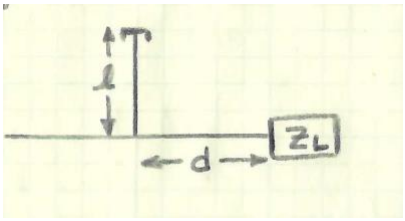
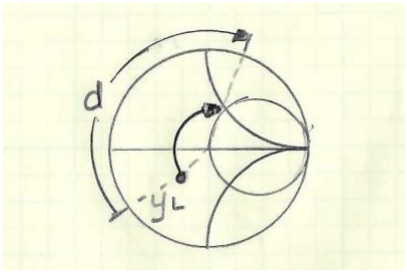
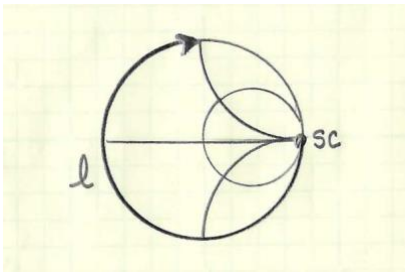
2025 W1

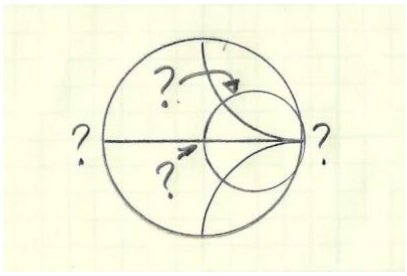
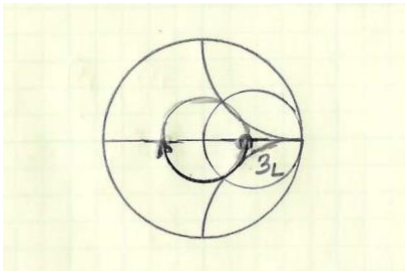
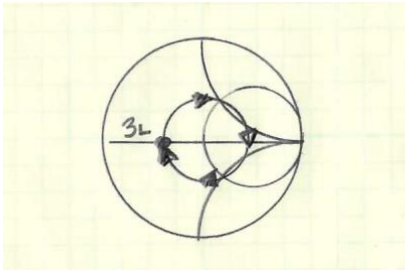
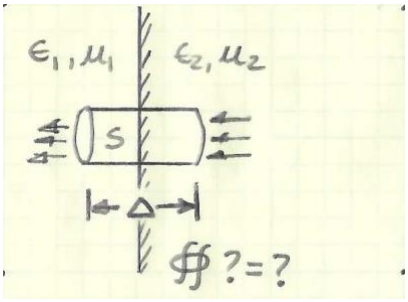
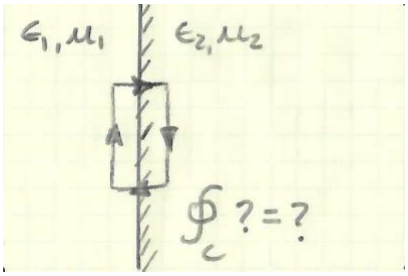


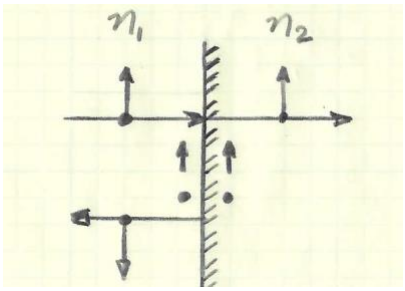
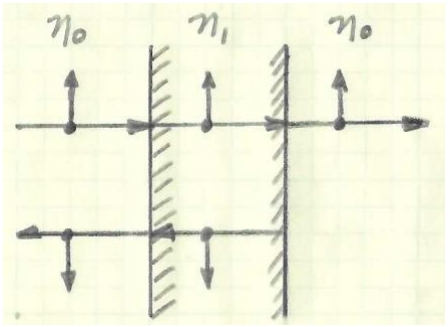
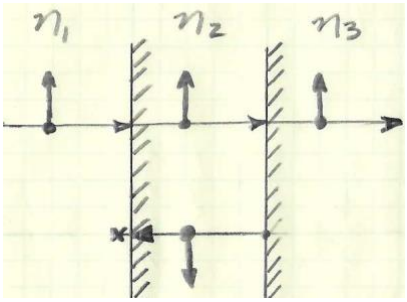
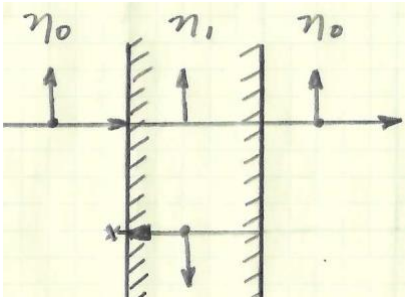
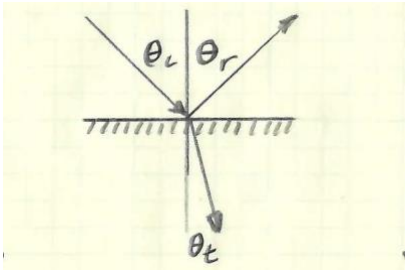
Twenty-Four Problem Scenarios

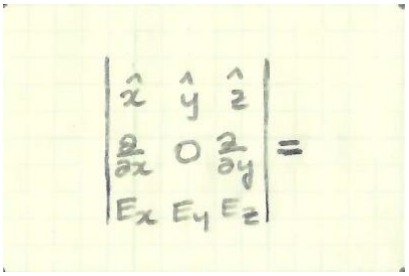
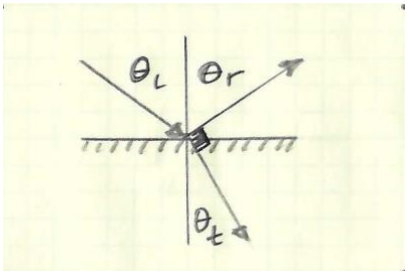
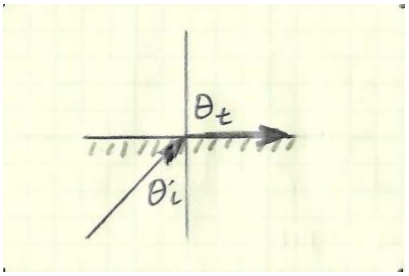
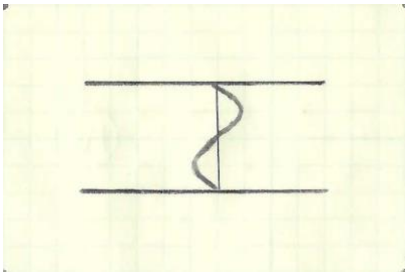
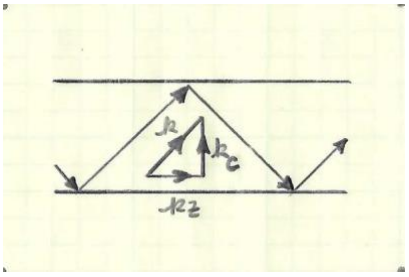
In ELEC 311, it is *not sufficient* to simply recognize and interpret equations. Here is a compilation of 24 *problem scenarios* that you need to be able to recognize, interpret, and solve.

Scenario	Interpretation
1  emf = $-N\ d\Phi/dt$	This problem scenario likely describes… … the emf induced due to motion of the conducting rod as it moves along the conducting rails in a constant magnetic field. The magnetic flux density B may be constant, but the total magnetic flux Φ increases with time as the enclosed area increases. The energy required to induce the emf comes from the force required to move the rod along the rails! If a scheme doesn't require that force be applied to change the flux, *e.g.*, switch-based schemes, then no emf will be generated.
2  $\theta = \delta/2$ where $\tan\delta = \sigma/\omega\epsilon$	This problem scenario likely describes…
3  $\delta = \frac{1}{\alpha} = \frac{1}{\sqrt{\pi f \mu \sigma}}$	This problem scenario likely describes…
4 	This problem scenario likely describes…

5  $Z = R + j\omega L, \quad Y = G + j\omega C$ $\gamma = \sqrt{ZY}, \quad Z_0 = \sqrt{Z/Y}$	This problem scenario likely describes…
6  $V_i(z) = V_{i,0}e^{-j\beta z}; V_r(z) = V_{r,0}e^{+j\beta z}$ $V_{max} = 1 + \|\Gamma\|; \; V_{min} = 1 - \|\Gamma\|$	This problem scenario likely describes…
7  	This problem scenario likely describes…
8  	This problem scenario likely describes…
9  	This problem scenario likely describes…

10 	This problem scenario likely describes…
11 	This problem scenario likely describes…
12 	This problem scenario likely describes…
13 	This problem scenario likely describes…
14 	This problem scenario likely describes…

15  $\Gamma = \frac{E_r}{E_i} = \frac{\eta_2 - \eta_1}{\eta_2 + \eta_1}$	This problem scenario likely describes…
16  $\lvert\Gamma_1\rvert^2$ $1 - \lvert\Gamma_1\rvert^2$	This problem scenario likely describes…
17  	This problem scenario likely describes…
18  	This problem scenario likely describes…
19  	This problem scenario likely describes…

20  	This problem scenario likely describes…
21  Upper region = 1; Lower region = 2.	This problem scenario likely describes…
22  	This problem scenario likely describes…
23 	This problem scenario likely describes…
24  $k = \frac{2\pi}{\lambda}$; $k_c = \frac{2\pi}{\lambda_c}$; $k_z = \frac{2\pi}{\lambda_g} = \beta$	This problem scenario likely describes…