Potentially useful formulae/info:

$\nabla \times \vec{\mathcal{H}} = \frac{\partial \vec{\mathcal{D}}}{\partial t} + \vec{\mathcal{J}};$ $\nabla \times \vec{\mathcal{E}} = -\frac{\partial \vec{\mathcal{B}}}{\partial t};$ $\nabla \cdot \vec{\mathcal{D}} = \rho;$ $\nabla \cdot \vec{\mathcal{B}} = 0;$

$\vec{\mathcal{B}} = \mu_0 \vec{\mathcal{H}} + \vec{\mathcal{M}};$ $\vec{\mathcal{D}} = \epsilon_0 \vec{\mathcal{E}} + \vec{\mathcal{P}};$ $\vec{\mathcal{P}} = \epsilon_0 \chi \vec{\mathcal{E}};$ $\vec{\mathcal{D}} = \epsilon \vec{\mathcal{E}};$ $n = \sqrt{\frac{\epsilon}{\epsilon_0}};$ $c_0 = \frac{1}{\sqrt{\epsilon_0 \mu_0}} \approx 3 \times 10^{10}\ \mathrm{cm/s}$

$$\vec{S} = \vec{E} \times \vec{\mathcal{H}} \quad I = \left\langle \vec{S} \right\rangle = \mathrm{Re}\left[\vec{S}\right] = \mathrm{Re}\left[\frac{1}{2}\vec{E} \times \vec{H}^*\right]$$

$$U(\vec{r}) = A_o \frac{W_o}{W(z)} \exp\left[-\left(\frac{\rho^2}{W^2(z)}\right)\right] \exp\left[ikz + ik\frac{\rho^2}{2R(z)} - i\zeta(z)\right]$$

$I = |U|^2;$ $W(z) = W_0\sqrt{1 + \left(\frac{z}{z_0}\right)^2};$ $R(z) = z\left[1 + \left(\frac{z_0}{z}\right)^2\right];$ $\zeta(z) = \tan^{-1}\left(\frac{z}{z_0}\right);$ $W_0 = \sqrt{\frac{\lambda z_0}{\pi}}$

$$W_o = \frac{W}{\sqrt{1 + \left(\frac{\pi W^2}{\lambda R}\right)^2}} \qquad z = \frac{R}{1 + \left(\frac{\lambda R}{\pi W^2}\right)^2}$$

$$I(\rho, z) = \frac{2P}{\pi W^2(z)} e^{-\frac{2\rho^2}{W^2(z)}} \qquad \frac{1}{q(z)} = \frac{1}{R(z)} + i\frac{\lambda}{\pi W^2(z)} \qquad \theta = \frac{w_o}{z_o}$$

$$(\nabla^2 + k^2)E = 0 \quad \left[\nabla_T^2 + i2k\frac{\partial}{\partial z}\right]A = 0 \quad \nabla_T^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = \frac{1}{\rho}\frac{\partial}{\partial \rho}\rho\frac{\partial}{\partial \rho}$$

$$t(x, y) = e^{ik_o d_o} e^{i(n-1)k_o d(x,y)}$$

$$\sqrt{1 + \Delta} = 1 + \frac{\Delta}{2} - \frac{\Delta^2}{8} + \ldots$$

•For f(x) about x=a, the Taylor expansion is:

$$f(x) = f(a) + f'(a)(x - a) + \frac{f''(a)}{2!}(x - a)^2 + \ldots$$