Exam 2

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1. (a)
   (b)
   (c)
   (d)
   (e)
   (f)
   (g)
   (h)
   (i)
   (j)
2. (a)
   (b)
   (c)
   (d)
3. First and foremost, we know $\sin(x) = \cos\left(x - \frac{\pi}{2}\right)$ and $-\cos(x) = \cos(x - \pi)$. This will be important for the following problems.

   (a) We are given the equation:

   $$\vec{E} = \hat{\mathbf{x}}5\sin(\omega t + z) - \hat{\mathbf{y}}5\cos(\omega t + z)\ \left[\frac{\mathrm{V}}{\mathrm{m}}\right]$$

   This can be rewritten as:

   $$\vec{E} = \hat{\mathbf{x}}5\cos\left(\omega t + z - \frac{\pi}{2}\right) + \hat{\mathbf{y}}5\cos\left(\omega t + z - \pi\right)\ \left[\frac{\mathrm{V}}{\mathrm{m}}\right]$$

   We can see that E_y lags E_x by $\pi/2$, or 90°. This, in tandem with the equal magnitudes define the above equation as Right-Hand Polarized.

(b) We are given the equation:

$$\vec{E} = \hat{\mathbf{z}}\cos(\omega t + x) - \hat{\mathbf{y}}\sin(\omega t + x) \ \left[\frac{\mathrm{V}}{\mathrm{m}}\right]$$

This can be rewritten as:

$$\vec{E} = \hat{\mathbf{z}}\cos\left(\omega t + x\right) + \hat{\mathbf{y}}\cos\left(\omega t + z - \frac{3\pi}{2}\right) \ \left[\frac{\mathrm{V}}{\mathrm{m}}\right]$$

$$\vec{E} = \hat{\mathbf{z}}\cos\left(\omega t + x\right) + \hat{\mathbf{y}}\cos\left(\omega t + z + \frac{\pi}{2}\right) \ \left[\frac{\mathrm{V}}{\mathrm{m}}\right]$$

We can see that E_y leads E_z by $\pi/2$, or $90°$. This, in tandem with the equal magnitudes define the above equation as Right-Hand Polarized.

(c) We are given the equation:

$$\vec{H} = \hat{\mathbf{x}}5\cos(\omega t - z) + \hat{\mathbf{y}}5\sin(\omega t - z) \ \left[\frac{\mathrm{mA}}{\mathrm{m}}\right]$$

This can be rewritten as:

$$\vec{H} = \hat{\mathbf{x}}5\cos(\omega t - z) + \hat{\mathbf{y}}5\cos\left(\omega t - z - \frac{\pi}{2}\right) \ \left[\frac{\mathrm{mA}}{\mathrm{m}}\right]$$

We can see that H_y lags H_x by $\pi/2$, or $90°$. This, in tandem with the equal magnitudes define the above equation as Right-Hand Polarized.