1. The electric field of an electromagnetic wave propagating in the $x$ direction is $E = E_0 k \sin(kx - \omega t)$, where $E_0 = 3 \text{ V/m}$ and $k = 20\pi \text{ rad/m}$.

(a) Give an expression for the magnetic field of this wave. Be sure your expression specifies the direction of the magnetic field and gives a numerical value for the strength of the field. (3 points)

(b) What is the wavelength of this wave? (1 point)

(c) What is the frequency (Hz) of this wave? (1 point)

(d) What is the average intensity of this wave? (2 points)

Rewrite and sign the Honor Pledge: *I pledge my honor that I have not violated the Honor Code during this examination.*
2. A plane electromagnetic wave of frequency $\omega$ and magnetic field amplitude $B_0$ is detected by means of a small coil of wire oriented perpendicular to the direction of the magnetic field in the wave. The coil is much smaller than the wavelength of the wave, so the magnetic field through the coil can be taken to be constant over the cross section of the coil and sinusoidally varying in time, $B = B_0 \sin \omega t$. The cross section of the coil encloses area $A$ and the coil contains $N$ turns. What is the emf in the coil resulting from the wave? (3 points)