9) \( E = 0.4A \) flows around a 1cm-radius loop.
   a) What is \( \mu \)?
   b) If \( \vec{B} = 1.5T \) with \( \mu \perp \vec{B} \), what is the torque on the loop?
   c) What is \( \Delta E \) for the loop parallel and antiparallel to \( \vec{B} \)? \( \mu \), actually?

   a) For a 1cm radius loop with \( i = 0.4A \),
   \[ \mu = iA = (0.4)(10^6(0.01)) = \frac{1.26 \times 10^{-4}}{5} \text{ C.m}^2 = \mu \]

   b) If \( \vec{\mu} \) is \( \perp \) to \( \vec{B} \), find \( \tau \)
   \[ \vec{\tau} = \vec{\mu} \times \vec{B} = \mu B \sin \theta \text{ out of page} \]
   \[ \tau = \mu B = (1.26 \times 10^{-4})(1.5) \]
   \[ \tau = 1.89 \times 10^{-4} \text{ N.m} \]

   c) Find \( \Delta E \) between parallel and antiparallel.
   \( \Delta E = -\vec{\mu} \cdot \vec{B} \)
   For parallel: \( U_{\parallel} = -\mu B \cos(0) = -\mu B \)
   For antiparallel: \( U_{\perp} = -\mu B \cos(\pi) = \mu B \)
   The difference is
   \[ \Delta E = U_{\perp} - U_{\parallel} = 2\mu B = 2\tau \]
   \[ \Delta E = 2(1.89 \times 10^{-4}) = 3.77 \times 10^{-4} \text{ J} \]