1. **IDENTIFY:** Apply $I = \varepsilon/R$.

**SET UP:** $d\Phi_B/dt = AdB/dt$.

**EXECUTE:** **(a)** $|\varepsilon| = \frac{Nd\Phi_B}{dt} = NA\frac{d}{dt}(B) = NA\frac{d}{dt}((0.012\ \text{T/s})t + (3.00\times10^{-5}\ \text{T/s}^4)t^4)$

$|\varepsilon| = NA((0.012\ \text{T/s}) + (1.2\times10^{-4}\ \text{T/s}^4)t^3) = 0.0302\ \text{V} + (3.02\times10^{-4}\ \text{V/s}^3)t^3.$

**(b)** At $t = 5.00$ s, $|\varepsilon| = 0.0302\ \text{V} + (3.02\times10^{-4}\ \text{V/s}^3)(5.00\ \text{s})^3 = 0.0680\ \text{V}.$

$I = \frac{\varepsilon}{R} = \frac{0.0680\ \text{V}}{600\ \Omega} = 1.13\times10^{-4}\ \text{A}.$

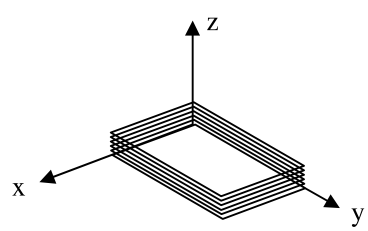
**EVALUATE:** The rate of change of the flux is increasing in time, so the induced current is not constant but rather increases in time.

2. A conducting circular loop of radius 0.250 m is placed in the x-y plane in a uniform magnetic field of 0.360 T that points in the positive z direction, the same direction as the normal to the plane.

   a) Calculate the magnetic flux through the loop.
   b) Suppose the loop is rotated clockwise around the x-axis, so the normal direction now points at $45.0^{\circ}$ angle with respect to the z-axis. Recalculate the magnetic flux through the loop.
   c) What is the change in the flux due to the rotation of the loop?

3. A coil with 25 turns of wire wrapped on a frame with a square cross-section 1.80 cm on a side. Each turn has the same area, equal to that of the frame. And the total resistance is 0.350 Ω. An applied uniform magnetic field is perpendicular to the coil as shown.

   a) If the field changes uniformly from 0.00 T to 0.500 T in 0.800 s, find the induced emf in the coil while the field is changing.
   b) Find the magnitude and direction of the induced current while the field is changing.




**Answers**

2. a) 0.0706 Wb b) 0.0499 Wb c) −0.0207 Wb
3. a) $-5.06\times10^{-3}$ V b) $1.45\times10^{-2}$ A