

52. (a) We use $\vec{\tau} = \vec{\mu} \times \vec{B}$, where $\vec{\mu}$ points into the wall (since the current goes clockwise around the clock). Since \vec{B} points towards the one-hour (or “5-minute”) mark, and (by the properties of vector cross products) $\vec{\tau}$ must be perpendicular to it, then (using the right-hand rule) we find $\vec{\tau}$ points at the 20-minute mark. So the time interval is 20 min.

(b) The torque is given by

$$\begin{aligned}\tau &= \left| \vec{\mu} \times \vec{B} \right| = \mu B \sin 90^\circ \\ &= NiAB = \pi N i r^2 B \\ &= 6\pi(2.0 \text{ A})(0.15 \text{ m})^2(70 \times 10^{-3} \text{ T}) \\ &= 5.9 \times 10^{-2} \text{ N}\cdot\text{m} .\end{aligned}$$