What is the flux $\Phi_B$ in this loop if:

(a) rotated about the $y$-axis

Let $\Phi_B = \int B \cdot dA$

\[
\Phi_B = \int_0^{2\pi} B_0 R^2 \sin \theta d\theta = 2\pi B_0 R^2 \cos \theta \bigg|_0^{2\pi} = 4\pi B_0 R^2
\]

(b) rotated about the $x$-axis

Rotating about the $x$-axis means $\Phi_B$ does not move along $x$ at all. Thus,

\[
\frac{d\Phi_B}{dt} = 0 \quad \text{and} \quad E = 0
\]

(c) rotated about an edge parallel to the $x$-axis

This yields the result of part (a)

\[
E = \frac{d\Phi_B}{dt} = d \frac{\Phi_B}{dt} = \frac{\Phi_B}{d\theta} \frac{d\theta}{dt} = \frac{\Phi_B}{d\theta} v
\]

Thus, $E = 0$ again.