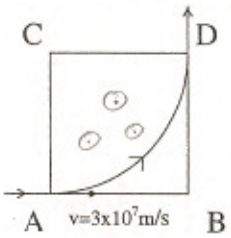
(1) A magnetic field is present in the square region ABCD ($AB = 5$ cm) shown in the figure. The magnetic field is perpendicular to the page. An electron enters at A from the left with a speed of 3×10^7 m/s and subsequently follows the trajectory shown.

(a) (5 points) If the electron follows the path in the figure, does the magnetic field go into the paper or out of the paper?



By RHR it would be ⊗ for a proton & ⊙ for an e^-

(b) (5 points) Calculate the magnitude of the magnetic field so that the electron exits at D and its direction is now vertical.

$$F_B = \frac{mv^2}{R}$$

$$qvB = \frac{mv^2}{R}$$

$$B = \frac{mv}{qR} = \frac{(9.11\times10^{-31})\,3\times10^7}{1.6\times10^{-19}\,(5\times10^{-2})} = \boxed{3.4\times10^{-3}\ T}$$

(c) (5 points) What is the speed of the electron at point D?

$\boxed{v = 3\times10^7\ m/s}$

(d) (5 points) How much time did the electron spend from A to D?

$$v = \frac{dist}{time}$$

$$t = \frac{2\pi R/4}{v} = \frac{2\pi(5\times10^{-2})}{12\times10^7} = \boxed{2.6\times10^{-9}\ s}$$