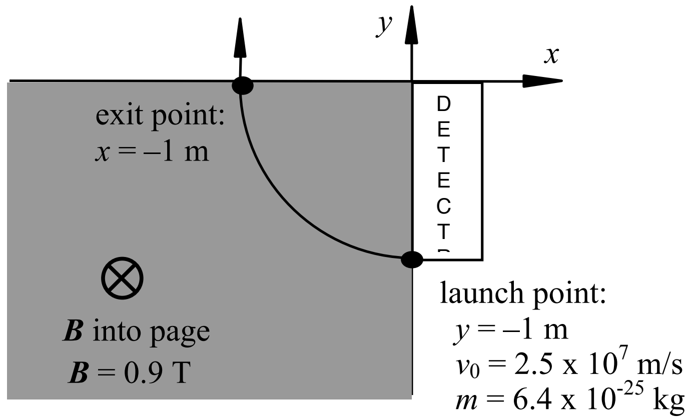
Name: __________________ Sec. _______ **P212: Quiz 1, Week 7**

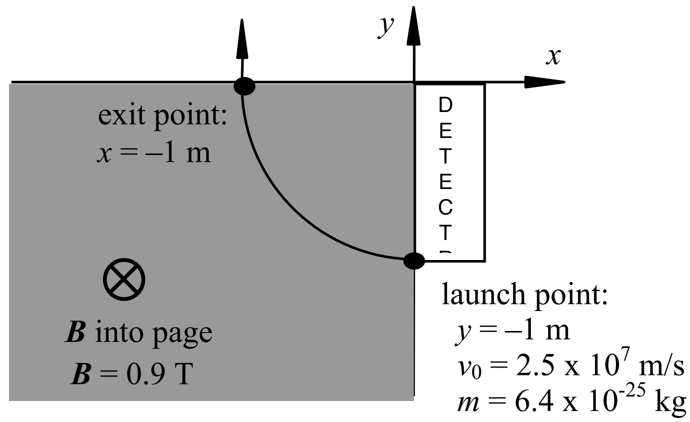
A charged particle of mass m and charge q is launched with initial velocity v_0 in the negative x direction. The launch position is $x = 0$, $y = -1$ m. After launch, the particle immediately finds itself in a constant $\boldsymbol{B}$ field which extends throughout the shaded region ($x < 0$, $y < 0$). A detector is located to the right of this region, but the particle's trajectory causes it to *miss* the detector. Instead, it leaves the field at the position $x = -1$ m, $y = 0$.



1) Given the values shown, what is the particle's charge q? Be sure to indicate both the magnitude and sign of the charge. **[5]**

2) What is the particle's kinetic energy T as it exits the $\boldsymbol{B}$ field region? **[3]**

3) What numerical inequality would have to be placed on the particle's initial velocity v_0 to ensure that curves sharply enough to enter the detector? **[5]**



4) Finally, a constant electric field ***E*** is added in the shaded region. The effect of this field is that all charged particles launched with initial speed v_0 *continue* to travel in the $-x$ direction, without being deflected at all! What is the magnitude and direction of this ***E*** field? **[3]**

5) Two resistors and an ideal battery are connected as shown in the diagram below. At $t = 0$, the capacitor is uncharged and the switch is closed. What is $V_C(0)$, the voltage across the capacitor immediately after the switch is closed? Express your answer in terms of the given variables $\mathcal{E}$, R, and C. **[4]**