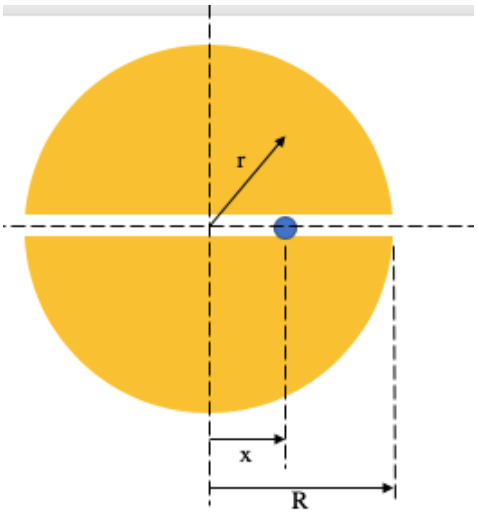
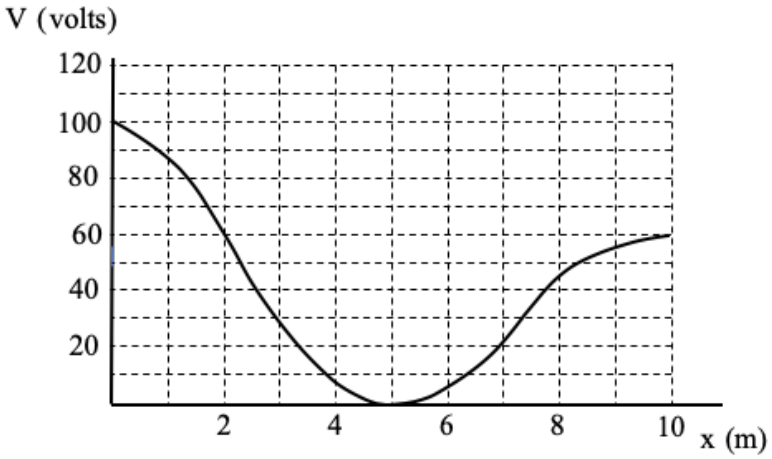
An insulating sphere of radius R = 10 m carries a volume charge density that changes both in sign and density as a function of r. A hole extends through the insulator. Inside the hole, located at x, is a non-conducting ball that carries a net positive charge. Both gravity and friction are negligible, and the ball does not exchange or accept charge from the sphere. The graph shows the electric potential V(r) for the region inside the hole due to the sphere.





a.) How far out from the center can the ball be released from rest and still exit the hole? Justify your response.

b.) The ball is released from rest from the position identified in Part a, and exits the hole. Describe the magnitude and direction of its acceleration between r = 5 m and r = 10 m. Explain your reasoning.

c.) It is suggested that the expression E(r) = A(B - r) models the electric field in the hole, where $0 < r < 10$ m. Assuming rightward is positive, A = 4 V/m^2 and B = 5 m, state one feature of this model that does NOT correctly model the electric field in this situation. Justify your response.

d.) Explain the steps one would have to execute to derive an expression for $\rho(r)$ using $E(r)$.