

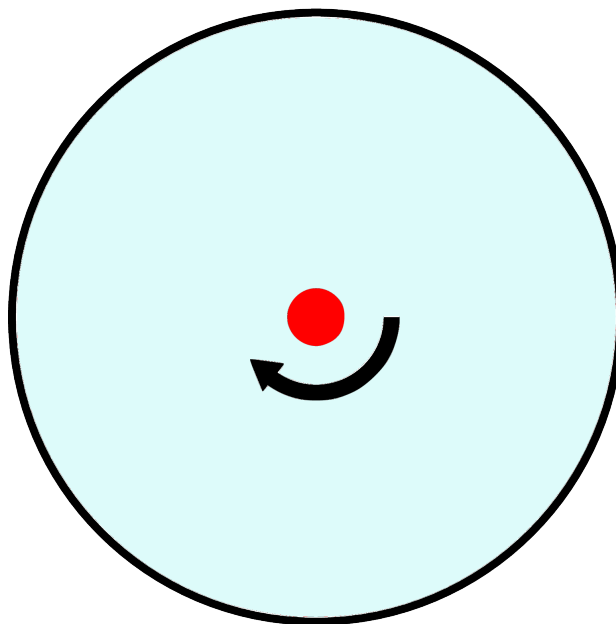


Vortices in Superfluid

Part A. Steady filament (0.75 points)

A.1 (0.25 pt)

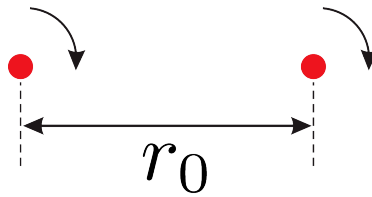
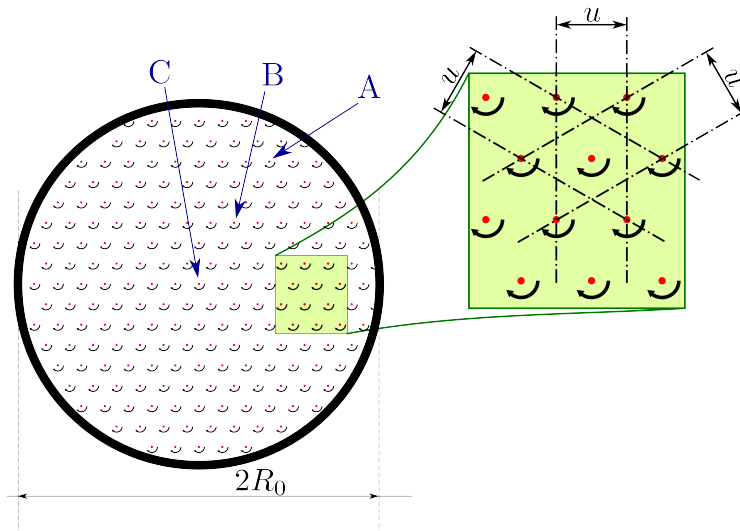
$v =$



A.2 (0.5 pt)

$z(r) =$


Part B. Vortex motion (1.4 points)
B.1 (0.25 pt)

 $v_0 =$

B.2 (0.15 pt)

B.3 (0.4 pt)

 $v(\vec{r}) =$
B.4 (0.35 pt)

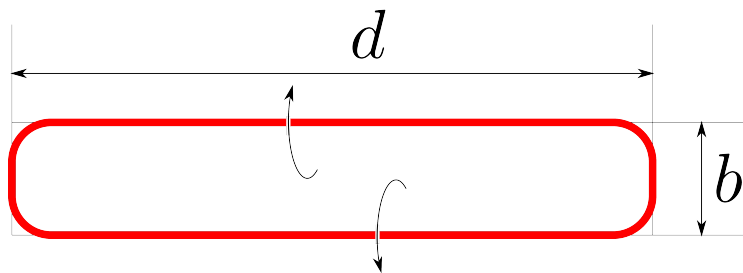
 $AB(t) =$


B.5 (0.25 pt)

$$z(\vec{r}) =$$

Part C. Momentum and Energy (1.75 points)
C.1 (0.3 pt)

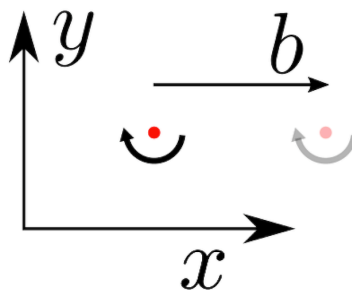
$$|\vec{P}| =$$


C.2 (0.7 pt)

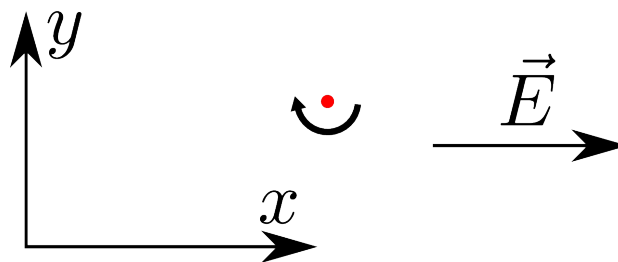
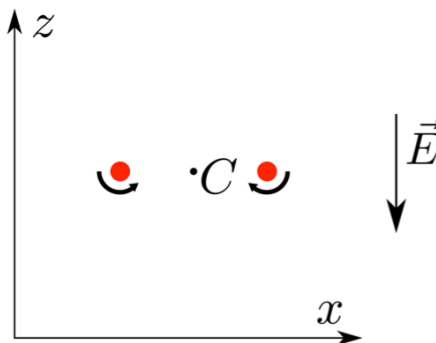
$$U =$$

C.3 (0.75 pt)

$$|\Delta\vec{P}| =$$




Part D. Trapped charges (2.85 points)
D.1 (0.5 pt)

 $v(t) =$

D.2 (0.6 pt)

 $R(t) =$
D.3 (1.5 pt)

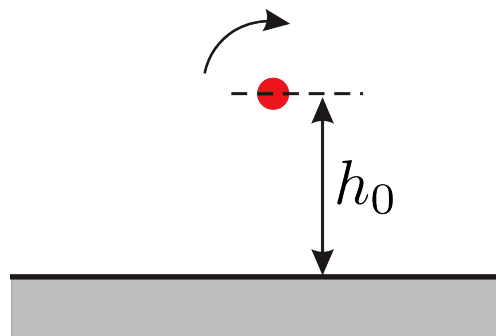
 $v(t) =$
D.4 (0.25 pt)

 $v(t) =$



Part E. Influence of the boundaries (3.25 points)

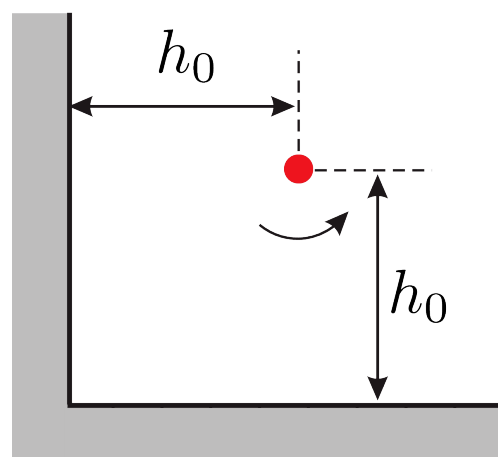
E.1 (0.5 pt)

 $v(t) =$ 

E.2 (0.75 pt)

 $v_0 =$

E.3 (0.5 pt)



E.4 (1.5 pt)

 $v_\infty =$