

1 Theory

Complete the following table:

Name	Expression	Differential Form
volume charge density		$dq = \rho dV$
	$\sigma \equiv \frac{Q}{A}$	
		$dq = \lambda dl$

2 Practice

The field above a positively charged infinite horizontal plane is given by

$$\mathbf{E} = \frac{\sigma}{2\epsilon_0} \hat{\mathbf{j}},$$

where σ is the uniform surface charge density, and ϵ_0 is the permittivity of free space. The strength of the field is such that a positively charged particle of mass m and charge q placed at a height h above the plane remains suspended.

- (a) What is σ in terms of ϵ_0 , q , m , and the local acceleration of gravity g ?
- (b) Why is h not involved in this expression?
- (c) What is the acceleration of the charge if it is placed *below* the plane?