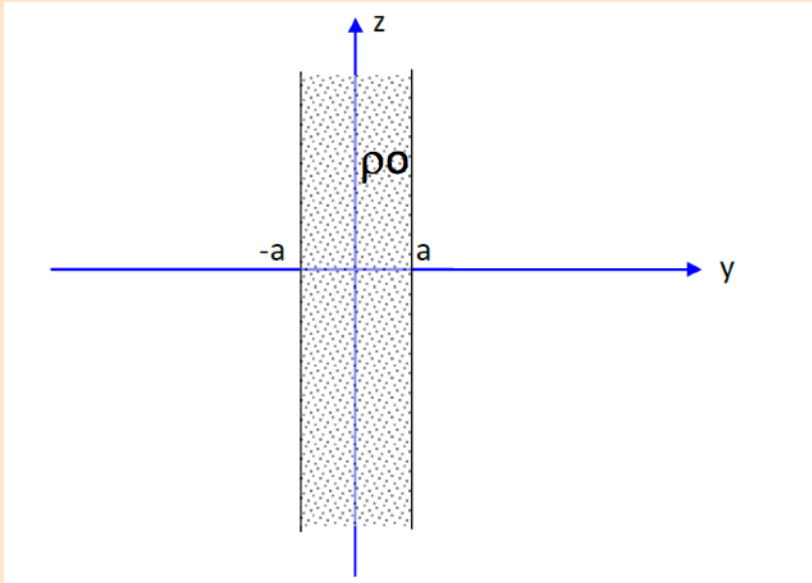


## Electric Field and Potential for an infinite slab with uniform charge density $\rho$

**PROBLEM:** Consider an infinite slab parallel to the  $x$ - $z$  plane (normal to the  $y$  axis) of uniform charge density  $\rho$  and thickness  $2a$ , as shown:



**Find the Electric Field and Potential everywhere.**

(a) First, present your arguments for treating this problem as one dimensional.

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We wish to derive the E field,  $\vec{E}(y)$ , at all values of  $y$ .

(b) Start with E outside the slab.

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(c) Now find E inside the slab.

<This is a text cell - enter your answer here.>

(d) Plot the magnitude of  $E(y)$  for both inside and outside the slab.

```
(* Input Cell - Enter your code here -- start with a ClearAll["`*"] *)  
ClearAll["`*"]
```

(e) Comment on this plot

<This is a text cell - enter your answer here.>

(f) Now generate a 2D Vector Plot of the E-Field both inside and outside of the slab of charge (assume a positive  $\rho$ ).

```
(* Input Cell - Enter your code here *)
```

(g) Comment on this vector plot

<This is a text cell - enter your answer here.>

(h) Derive and plot the 1D Electric Potential vs.  $y$  for the above E Field.

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```

(i) Comment on this result (the plot).

<This is a text cell - enter your answer here.>

