3. Find the solution to the diffusion equation for 1-group, slab geometry, where the material is a pure scatter and the slab width is X:

The one group, slab geometry diffusion equation for slab geometry is:

Has a solution of the form:

x=-X/2

x=X/2

x=0

The boundary conditions:

Marshak:

Mark:

Vacuum Dirichlet:

Reflective:

Albedo:

As long as we don’t divide by zero, the albedo boundary condition represents the reflected when

and vacuum when

1. **Vacuum Marshak Conditons**

Given:

The Marshak boundary at the right side becomes:

And at the left side:

Plugging in A

There is probably an easier more correct solution but:

And by symmetry:

If we assume a scattering dominate system, then D can be approximated by:

This would simplify our constant to:

Notice that B and A are always negative. Plotting this solution with .



I would expect the solution to go to zero at a distance of 0.5+0.66=1.16, not 1.41. Where did I go wrong?

I probably did something wrong: Code for plotting reproduced below:

Es=1;X=1;q=1;

%Plot Solution

B=(exp(-1)+3)/(exp(-3/2)-9\*exp(1/2));

x=linspace(-1.41,1.41);

phi=B.\*exp(x)+B.\*exp(-x)+1;

plot(x,phi,'r','LineWidth',2);

%Plot Bars

hold on

y=linspace(0,0.55);

xn=ones(1,100).\*-0.5;xp=ones(1,100).\*0.5;

plot(xn,y,'b','LineWidth',3);

plot(xp,y,'b','LineWidth',3);

grid on;xlabel 'X';ylabel '\phi';

legend ('\phi Marshak','Boundaries');

ylim([0,0.55]);

1. **Vacuum Mark Conditions:**

Given: