22.106 Neutron Interactions and Applications
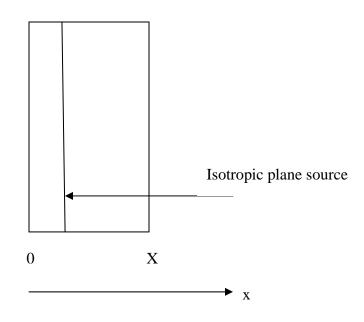# Problem Set 4

Due SES #16

Question 1

Derive the time-dependent equation system in an arbitrary volume element V that describes the transport of neutrons and photons. Assume that neutron interactions are limited to neutron capture and neutron scattering and that the photon interactions are limited to scattering and photoneutron reactions.

Explain in your own words the meaning of all the terms.

Question 2

Starting from the one-dimensional integro-differential form of the transport equation, solve for the angular flux in the following slab with a plane isotropic source at $x = X/3$. Assume vacuum boundary conditions at both boundaries of the slab.

Isotropic plane source

0   X

x

Question 3

Starting from the one-dimensional integro-differential form of the transport equation, solve for the angular flux in the previous slab with a plane source at $x = X/3$ isotropic only in the positive direction of the polar angle (i.e. isotropic between μ of 0 and 1,
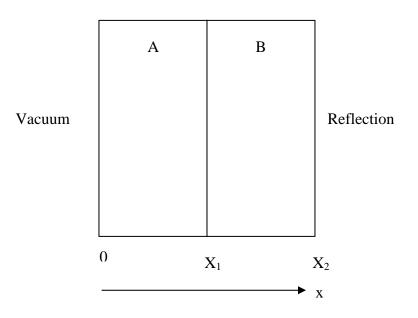
source is zero in the negative direction). Assume reflective boundary condition on the left side and vacuum on the right.

Question 4

Explain conceptually what the neutron transport equation represents.

Question 5

Starting from the one-dimensional mono-energetic integro-differential form of the transport equation, solve for the angular flux <u>in slab A</u>. A uniform isotropic source of strength S_0 is located in slab A and both slabs are purely absorbing. Assume vacuum boundary conditions on the left boundary and reflective on the right.

A   B

Vacuum   Reflection

0   X_1 X_2

x

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