Flux in box — bounded half space

①

A From Carslaw + Jaeger p100:

20 T diffusion_in_slab ξ

$$\frac{C}{C_0} = 1 - \frac{4}{\pi}\sum_{n=0}^{\infty}\frac{(-1)^n}{2n+1} e^{-(2n+1)^2\pi^2 T/16} \cos\frac{(2n+1)\pi\xi}{2}$$

$$\xi = \frac{x}{l}, \quad l = \text{width of slab}$$

$$T = \frac{4Dt}{l^2}$$

$$\left.\frac{\partial C/C_0}{\partial \xi}\right|_{\xi=1} = \qquad \frac{(2n+1)\pi}{2} \sin\frac{(2n+1)\pi\xi}{2}$$

nt

20 T flux_into_slab 1

$$= 2\sum_{n=0}^{\infty}(-1)^n e^{-(2n+1)^2\pi^2 T/16} \sin\frac{(2n+1)\pi}{2}$$

$$J = \frac{D}{l}\frac{\partial C/C_0}{\partial \xi}$$

NOTE: at small T this $\sim \frac{1}{\sqrt{T}}$ $\; \parallel \; \frac{2\sqrt{Dt}}{l} = \bar{y}$

This is $\left.\frac{\partial \bar{C}}{\partial x}\right|_{x=1} \cong \frac{1}{2\sqrt{Dt}}$ $\; \parallel \; \bar{y}$

$\bar{G}_c \cong \frac{1}{\sqrt{t}}$

$G_E = \frac{1}{H\sqrt{E}}$

$$\pi^2 T/4 = .0123$$

T = .005

n	$e^{()}$	$e^{()}/2n+1$	
0	.987	.987	.98
1	.894	.298	.682
2	.734	.146	.828
3	.546	.078	.750
4	.368	.0409	.790
5	.224	.0203	.770

$\times \frac{4}{\pi} = .9812$

$1 - .9812 = .0188$

x = 0

T = .005

close!

This all check out!