(19.9) The LOPO reactor in exercise 19.6 has a neutron age τ = 31.4 cm2, and diffusion area L2 1.87 cm2. Calculate (a) the fast neutron leakage factor, and (b) the critical radius for the homogeneous sphere, if $k_{infinity}$ = 1.50.

Data given in the text:

$$\tau := 31.4 \cdot cm^2 \qquad L_2 := 1.87 \cdot cm^2 \qquad k_{inf} := 1.50 \qquad f := 0.75$$

(a) Leakage factor:

$$M_2 := L_2 + \tau \qquad B_2 := \frac{k_{inf} - 1}{M_2} \qquad \Lambda_{th} := \frac{1}{1 + B_2 \cdot L_2} \qquad \Lambda_f := exp\left(-B_2 \cdot \tau\right)$$

$$\Lambda := \Lambda_f \Lambda_{th} \qquad\qquad \Lambda = 0.607$$

(b) Radius of critical sphere:

$$radius := \sqrt{\frac{\pi^2}{B_2}} \qquad\qquad radius = 0.256 \cdot m$$

The critical radius calculated in this way is not exactly correct because the mean free path of the neutrons is not negligible in comparison with the radius.