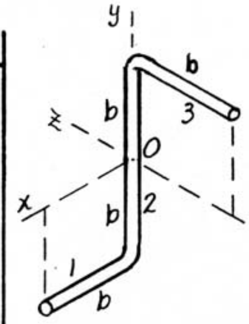
*B/70

		Part 1	2	3	Total
Prob. B/27	I_{xx}	$\frac{1}{4}mb^2$	$\frac{1}{6}mb^2$	$\frac{1}{3}mb^2$	$\frac{3}{4}mb^2$
	I_{yy}	$\frac{1}{12}mb^2$	0	$\frac{1}{12}mb^2$	$\frac{1}{6}mb^2$
	I_{zz}	$\frac{1}{3}mb^2$	$\frac{1}{6}mb^2$	$\frac{1}{4}mb^2$	$\frac{3}{4}mb^2$
Prob. B/60	I_{xy}	$-\frac{1}{8}mb^2$	0	0	$-\frac{1}{8}mb^2$
	I_{xz}	0	0	0	0
	I_{yz}	0	0	$-\frac{1}{8}mb^2$	$-\frac{1}{8}mb^2$



Substitute in Eq. B/11 and let $I = I_0 mb^2$

$$\begin{vmatrix} \frac{3}{4}-I_0 & \frac{1}{8} & 0 \\ \frac{1}{8} & \frac{1}{6}-I_0 & \frac{1}{8} \\ 0 & \frac{1}{8} & \frac{3}{4}-I_0 \end{vmatrix} = 0$$

Expand & get

$$I_0^3 - \frac{5}{3}I_0^2 + \frac{25}{32}I_0 - \frac{9}{128} = 0$$

Solve by computer program or by algebraic formula. (In this case expansion of the determinant yields a common factor $(\frac{3}{4}-I_0)$ so the cubic becomes

$$\left(\tfrac{3}{4}-I_0\right)\left(\left[\tfrac{1}{6}-I_0\right]\left[\tfrac{3}{4}-I_0\right]-\tfrac{1}{32}\right)=0 \text{ or } \left(\tfrac{3}{4}-I_0\right)\left(I_0^2-\tfrac{11}{12}I_0+\tfrac{3}{32}\right)=0$$

so $I_{0_1} = 0.750$ or $\underline{I_1 = 0.750\, mb^2}$

$I_{0_2} = 0.799$ $\underline{I_2 = 0.799\, mb^2}$

$I_{0_3} = 0.1173$ $\underline{I_3 = 0.1173\, mb^2}$

For $I_3 = 0.1173\, mb^2$ (minimum moment of inertia) the direction cosines satisfy Eq. B/12 & $l^2+m^2+n^2=1$ so

$$\left.\begin{aligned} 0.633\,l + 0.125m + 0 &= 0 \\ 0.125\,l + 0.0494m + 0.125n &= 0 \\ 0 + 0.125m + 0.633n &= 0 \end{aligned}\right\}$$

Sol. gives $l=m=n=0$ and also

$\underline{l = 0.1903,}$

$\underline{m = -0.963,}$

$\underline{n = 0.1903}$