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$$\epsilon_{xx} := 250 \quad (1)$$

>

> # *using a Rosette*

> epsilon[a] := .0008

$$\epsilon_{a} := 0.0008 \quad (2)$$

> epsilon[b] := .0001

$$\epsilon_{b} := 0.0001 \quad (3)$$

> epsilon[c] := .004

$$\epsilon_{c} := 0.004 \quad (4)$$

> theta := $\frac{\text{pi}}{4}$

$$\theta := \frac{1}{4}\,\pi \quad (5)$$

> E := 103000

$$E := 103000 \quad (6)$$

> nu := 0.2

$$\nu := 0.2 \quad (7)$$

> epsilon[xx] := epsilon[a]

$$\epsilon_{xx} := 0.0008 \quad (8)$$

> epsilon[yy] := $\frac{(\,\text{epsilon}[a] - 2\text{epsilon}[b])\sin(4\cdot\text{theta}) + 2\cdot\text{epsilon}[c]\cdot\sin(2\cdot\text{theta})}{4\cdot\sin^2(\text{theta})\cdot\sin(2\cdot\text{theta})}$

$$\epsilon_{yy} := \frac{1}{4}\,\frac{0.0006\,\sin(\pi) + 0.008\,\sin\left(\frac{1}{2}\,\pi\right)}{\sin\left(\frac{1}{4}\,\pi\right)^2\,\sin\left(\frac{1}{2}\,\pi\right)} \quad (9)$$

> epsilon[zz] := 0

$$\epsilon_{zz} := 0 \quad (10)$$

> epsilon[xy] := $\frac{1}{4\cdot\sin^2(\text{theta})\cdot\sin(2\cdot\text{theta})}\,(2\,\text{epsilon}[a](\sin^2(\text{theta}) * \cos^2(2\cdot\,\text{theta}) - \sin^2(2$

$\cdot$ theta) * $\cos^2$(theta)) + 2(epsilon[b]$\sin^2$(2 $\cdot$theta) − epsilon[c]$\cdot\sin^2$(theta)))

$$\epsilon_{xy} := \frac{1}{4}\,\frac{0.0016 + 0.0002\sin\left(\frac{1}{2}\pi\right)^2 - 0.008\sin\left(\frac{1}{4}\pi\right)^2}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)} \tag{11}$$

>

> epsilon[xz] := 0

$$\epsilon_{xz} := 0 \tag{12}$$

> epsilon[yz] := 0

$$\epsilon_{yz} := 0 \tag{13}$$

> sigma[xx] := $\frac{E}{(1+\mathrm{nu})\cdot(1-2\cdot\mathrm{nu})}$((1 − nu)epsilon[$xx$] + nu(epsilon[$yy$] + epsilon[$zz$]))

#equ3.32

$$\sigma_{xx} := 28702.66668 \tag{14}$$

> sigma[yy] := $\frac{E}{(1+\mathrm{nu})\cdot(1-2\cdot\mathrm{nu})}$((1 − nu)epsilon[$yy$] + nu(epsilon[$xx$] + epsilon[$zz$]))

#equ3.32

$$\sigma_{yy} := \frac{28611.11112\left(0.0006\sin(\pi) + 0.008\sin\left(\frac{1}{2}\pi\right)\right)}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)} + 28611.11112 \tag{15}$$

> sigma[zz] := $\frac{E}{(1+\mathrm{nu})\cdot(1-2\cdot\mathrm{nu})}$((1 − nu)epsilon[$zz$] + nu(epsilon[$xx$] + epsilon[$yy$]))

#equ3.32

$$\sigma_{zz} := 28611.11112 \tag{16}$$

> sigma[xy] := $\frac{E}{1+\nu}\cdot$epsilon[xy'']$\cdot$0*#equ3.32*

$$\sigma_{xy} := 0. \tag{17}$$

> sigma[xz] := $\frac{E}{1+\nu}\cdot$epsilon[xz'']$\cdot$0*#equ3.32*

$$\sigma_{xz} := 0. \tag{18}$$

> sigma[yz] := $\frac{E}{1+\nu}\cdot$epsilon[yz'']$\cdot$0*#equ3.32*

$$\sigma_{yz} := 0. \tag{19}$$

> Iota[1] := sigma[xx] + sigma[yy] + sigma[zz]*#eq2.78*

$$I_1 := 85924.88892 + \frac{28611.11112\left(0.0006\sin(\pi) + 0.008\sin\left(\frac{1}{2}\pi\right)\right)}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)} \tag{20}$$

> Iota[2] := sigma[xx]$\cdot$sigma[yy] + sigma[xx]$\cdot$sigma[zz] + sigma[yy]$\cdot$sigma[zz] − sigma[xy]^2 −

$$-\text{sigma}[xz]^2-\text{sigma}[yz]^2 \;\#eq2.78$$

$$I_2 := \frac{1.639810865\ 10^9\left(0.0006\sin(\pi)+0.008\sin\left(\frac{1}{2}\pi\right)\right)}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)}+2.461026052\ 10^9 \tag{21}$$

> $\text{Iota}[3] := \mathit{LinearAlgebra}[\mathit{Determinant}]\left(\begin{bmatrix}\text{sigma}[xx] & \text{sigma}[xy] & \text{sigma}[xz]\\ \text{sigma}[xy] & \text{sigma}[yy] & \text{sigma}[yz]\\ \text{sigma}[xz] & \text{sigma}[yz] & \text{sigma}[zz]\end{bmatrix}\right) \;\#eq2.78$

$$I_3 := \frac{1}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)}\left(1.409752736\ 10^{10}\sin(\pi)+1.879670314\ 10^{11}\sin\left(\frac{1}{2}\pi\right)\right. \tag{22}$$

$$\left.+2.349587893\ 10^{13}\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)\right)$$

> $equ := M^3-\text{Iota}[1]\cdot M^2+\text{Iota}[2]\cdot M-\text{Iota}[3] \;\#equ\ 2.77b$

$$equ := M^3-M^2\left(85924.88892+\frac{28611.11112\left(0.0006\sin(\pi)+0.008\sin\left(\frac{1}{2}\pi\right)\right)}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)}\right) \tag{23}$$

$$+M\left(\frac{1.639810865\ 10^9\left(0.0006\sin(\pi)+0.008\sin\left(\frac{1}{2}\pi\right)\right)}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)}+2.461026052\ 10^9\right)$$

$$-\frac{1}{\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)}\left(1.409752736\ 10^{10}\sin(\pi)+1.879670314\ 10^{11}\sin\left(\frac{1}{2}\pi\right)\right.$$

$$\left.+2.349587893\ 10^{13}\sin\left(\frac{1}{4}\pi\right)^2\sin\left(\frac{1}{2}\pi\right)\right)$$

> $solve(equ, M)$

$$\frac{1}{\cos(0.2500000000\,\pi)^2-1.}\left(1.066666667\ 10^{-8}\left(8.218063680\ 10^{27}\cos(0.2500000000\,\pi)^6\right.\right.$$

$$-1.887569401\ 10^{29}\cos(0.2500000000\,\pi)^4$$

$$+5.859375000\ 10^{11}\cos(0.2500000000\,\pi)^2\left(-1.955398253\ 10^{34}\cos(0.2500000000\,\pi)^8\right.$$

$$-1.138259802\ 10^{35}\cos(0.2500000000\,\pi)^6-2.818706112\ 10^{35}\cos(0.2500000000\,\pi)^4$$

$$\left.\left.-2.593191992\ 10^{35}\cos(0.2500000000\,\pi)^2-6.223804016\ 10^{34}\right)^{1/2}\right)$$

$$-3.730976132\ 10^{29}\cos(0.2500000000\,\pi)^2$$

$$
\begin{aligned}
&- 5.859375000\ 10^{11}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\\
&- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\\
&\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\\
&\left.- 2.930852181\ 10^{27}\right)^{1/3}\Big)\\
&+ \left(3.200000000\ 10^{-8}\ \left(6.309192092\ 10^{18} \cos(0.2500000000\ \pi)^{4} + 6.993801270\ 10^{18} \cos(0.2500000000\ \pi)\right.\right.\\
&\left.\left.- 1.\right)\ \left(8.218063680\ 10^{27} \cos(0.2500000000\ \pi)^{6}\right.\right.\\
&\left.\left.- 1.887569401\ 10^{29} \cos(0.2500000000\ \pi)^{4}\right.\right.\\
&\left.\left.+ 5.859375000\ 10^{11} \cos(0.2500000000\ \pi)^{2}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\right.\right.\\
&\left.\left.\left.- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\\
&\left.\left.\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\right.\right.\\
&\left.\left.- 3.730976132\ 10^{29} \cos(0.2500000000\ \pi)^{2}\right.\right.\\
&\left.\left.- 5.859375000\ 10^{11}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\right.\right.\\
&\left.\left.\left.- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\\
&\left.\left.\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\right.\right.\\
&\left.\left.\left.- 2.930852181\ 10^{27}\right)^{1/3}\Big)\right.\right.\\
&+ \frac{1}{\cos(0.2500000000\ \pi)^{2} - 1.}\left(3.200000000\ 10^{-8}\ \left(8.943356485\ 10^{11}\right.\right.\\
&\left.\left.\cos(0.2500000000\ \pi)^{2} - 8.970775466\ 10^{11}\right)\right),\\
&- \frac{1}{\cos(0.2500000000\ \pi)^{2} - 1.}\left(5.333333333\ 10^{-9}\ \left(8.218063680\ 10^{27}\right.\right.\\
&\left.\left.\cos(0.2500000000\ \pi)^{6} - 1.887569401\ 10^{29} \cos(0.2500000000\ \pi)^{4}\right.\right.\\
&\left.\left.+ 5.859375000\ 10^{11} \cos(0.2500000000\ \pi)^{2}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\right.\right.\\
&\left.\left.\left.- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\\
&\left.\left.\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\right.\right.\\
&\left.\left.- 3.730976132\ 10^{29} \cos(0.2500000000\ \pi)^{2}\right.\right.
\end{aligned}
$$

$$
\begin{aligned}
&- 5.859375000\ 10^{11}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\\
&- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\\
&\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\\
&\left.- 2.930852181\ 10^{27}\right)^{1/3}\Big)\\
&- \left(1.600000000\ 10^{-8}\ \left(6.309192092\ 10^{18} \cos(0.2500000000\ \pi)^{4} + 6.993801270\ 10^{18} \cos(0.2500000000\ \pi)\right.\right.\\
&\left.\left.- 1.\right)\ \left(8.218063680\ 10^{27} \cos(0.2500000000\ \pi)^{6}\right.\right.\\
&\left.\left.- 1.887569401\ 10^{29} \cos(0.2500000000\ \pi)^{4}\right.\right.\\
&\left.\left.+ 5.859375000\ 10^{11} \cos(0.2500000000\ \pi)^{2}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\right.\right.\\
&\left.\left.\left.- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\\
&\left.\left.\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\right.\right.\\
&\left.\left.- 3.730976132\ 10^{29} \cos(0.2500000000\ \pi)^{2}\right.\right.\\
&\left.\left.- 5.859375000\ 10^{11}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\right.\right.\\
&\left.\left.\left.- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\\
&\left.\left.\left.- 2.593191992\ 10^{35} \cos(0.2500000000\ \pi)^{2} - 6.223804016\ 10^{34}\right)^{1/2}\right.\right.\\
&\left.\left.\left.- 2.930852181\ 10^{27}\right)^{1/3}\Big)\right)\\
&+ \frac{3.200000000\ 10^{-8}\ \left(8.943356485\ 10^{11} \cos(0.2500000000\ \pi)^{2} - 8.970775466\ 10^{11}\right)}{\cos(0.2500000000\ \pi)^{2} - 1.}\\
&+ 0.8660254038\ \mathrm{I}\ \left(\frac{1}{\cos(0.2500000000\ \pi)^{2} - 1.}\ \left(1.066666667\ 10^{-8}\right.\right.\\
&\left.\left.\left(8.218063680\ 10^{27} \cos(0.2500000000\ \pi)^{6} - 1.887569401\ 10^{29} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\\
&\left.\left.\left.+ 5.859375000\ 10^{11} \cos(0.2500000000\ \pi)^{2}\ \left(- 1.955398253\ 10^{34} \cos(0.2500000000\ \pi)^{8}\right.\right.\right.\right.\\
&\left.\left.\left.\left.- 1.138259802\ 10^{35} \cos(0.2500000000\ \pi)^{6} - 2.818706112\ 10^{35} \cos(0.2500000000\ \pi)^{4}\right.\right.\right.\right.
\end{aligned}
$$

$$-2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2-6.223804016\,10^{34}\Big)^{1/2}$$

$$-3.730976132\,10^{29}\cos(0.2500000000\,\pi)^2$$

$$-5.859375000\,10^{11}\Big(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8$$

$$-1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6-2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$

$$-2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2-6.223804016\,10^{34}\Big)^{1/2}$$

$$-2.930852181\,10^{27}\Big)^{1/3}\Big)$$

$$-\Big(3.200000000\,10^{-8}\Big(6.309192092\,10^{18}\cos(0.2500000000\,\pi)^4+6.993801270\,10^{18}\cos(0.2500000000\,\pi)$$

$$-1.\Big)\Big(8.218063680\,10^{27}\cos(0.2500000000\,\pi)^6$$

$$-1.887569401\,10^{29}\cos(0.2500000000\,\pi)^4$$

$$+5.859375000\,10^{11}\cos(0.2500000000\,\pi)^2\Big(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8$$

$$-1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6-2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$

$$-2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2-6.223804016\,10^{34}\Big)^{1/2}$$

$$-3.730976132\,10^{29}\cos(0.2500000000\,\pi)^2$$

$$-5.859375000\,10^{11}\Big(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8$$

$$-1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6-2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$

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$$-2.930852181\,10^{27}\Big)^{1/3}\Big)\Big),$$

$$-\frac{1}{\cos(0.2500000000\,\pi)^2-1.}\Big(5.333333333\,10^{-9}\Big(8.218063680\,10^{27}$$

$$\cos(0.2500000000\,\pi)^6 - 1.887569401\,10^{29}\cos(0.2500000000\,\pi)^4$$
$$+ 5.859375000\,10^{11}\cos(0.2500000000\,\pi)^2\left(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8\right.$$
$$- 1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6 - 2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$
$$\left.- 2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2 - 6.223804016\,10^{34}\right)^{1/2}$$
$$- 3.730976132\,10^{29}\cos(0.2500000000\,\pi)^2$$
$$- 5.859375000\,10^{11}\left(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8\right.$$
$$- 1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6 - 2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$
$$\left.- 2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2 - 6.223804016\,10^{34}\right)^{1/2}$$
$$\left.- 2.930852181\,10^{27}\right)^{1/3}\Big)$$
$$- \left(1.600000000\,10^{-8}\left(6.309192092\,10^{18}\cos(0.2500000000\,\pi)^4 + 6.993801270\,10^{18}\cos(0.2500000000\,\pi)\right.\right.$$
$$\left.\left.- 1.\right)\left(8.218063680\,10^{27}\cos(0.2500000000\,\pi)^6\right.\right.$$
$$- 1.887569401\,10^{29}\cos(0.2500000000\,\pi)^4$$
$$+ 5.859375000\,10^{11}\cos(0.2500000000\,\pi)^2\left(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8\right.$$
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$$- 3.730976132\,10^{29}\cos(0.2500000000\,\pi)^2$$
$$- 5.859375000\,10^{11}\left(-1.955398253\,10^{34}\cos(0.2500000000\,\pi)^8\right.$$
$$- 1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6 - 2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$
$$\left.- 2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2 - 6.223804016\,10^{34}\right)^{1/2}$$
$$\left.\left.- 2.930852181\,10^{27}\right)^{1/3}\right)$$
$$+ \frac{3.200000000\,10^{-8}\left(8.943356485\,10^{11}\cos(0.2500000000\,\pi)^2 - 8.970775466\,10^{11}\right)}{\cos(0.2500000000\,\pi)^2 - 1.}$$
$$- 0.8660254038\,\mathrm{I}\left(\frac{1}{\cos(0.2500000000\,\pi)^2 - 1.}\left(1.066666667\,10^{-8}\right.\right.$$

$$\left(8.218063680\ 10^{27}\cos(0.2500000000\,\pi)^6 - 1.887569401\ 10^{29}\cos(0.2500000000\,\pi)^4\right.$$

$$+ 5.859375000\ 10^{11}\cos(0.2500000000\,\pi)^2\left(-1.955398253\ 10^{34}\cos(0.2500000000\,\pi)^8\right.$$

$$- 1.138259802\ 10^{35}\cos(0.2500000000\,\pi)^6 - 2.818706112\ 10^{35}\cos(0.2500000000\,\pi)^4$$

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$$\left.\left.- 2.593191992\ 10^{35}\cos(0.2500000000\,\pi)^2 - 6.223804016\ 10^{34}\right)^{1/2}\right.$$

$$\left.\left.- 2.930852181\ 10^{27}\right)^{1/3}\right)$$

$$- \left(3.200000000\ 10^{-8}\left(6.309192092\ 10^{18}\cos(0.2500000000\,\pi)^4 + 6.993801270\ 10^{18}\cos(0.2500000000\,\pi)\right.\right.$$

$$\left.\left.- 1.\right)\left(8.218063680\ 10^{27}\cos(0.2500000000\,\pi)^6\right.\right.$$

$$- 1.887569401\ 10^{29}\cos(0.2500000000\,\pi)^4$$

$$+ 5.859375000\ 10^{11}\cos(0.2500000000\,\pi)^2\left(-1.955398253\ 10^{34}\cos(0.2500000000\,\pi)^8\right.$$

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$$\left.- 2.593191992\ 10^{35}\cos(0.2500000000\,\pi)^2 - 6.223804016\ 10^{34}\right)^{1/2}$$

$$\left.- 3.730976132\ 10^{29}\cos(0.2500000000\,\pi)^2\right.$$

$$- 5.859375000\ 10^{11}\left(-1.955398253\ 10^{34}\cos(0.2500000000\,\pi)^8\right.$$

$$-1.138259802\,10^{35}\cos(0.2500000000\,\pi)^6 - 2.818706112\,10^{35}\cos(0.2500000000\,\pi)^4$$

$$-2.593191992\,10^{35}\cos(0.2500000000\,\pi)^2 - 6.223804016\,10^{34}\Big)^{1/2}$$

$$-2.930852181\,10^{27}\Big)^{1/3}\Big)\Big)$$

> $M[1] := ....$

Error, Got internal error in Typesetting:-Parse : "invalid subscript selector"

$M[1] := ....$

> $M[2] := ....$

Error, Got internal error in Typesetting:-Parse : "invalid subscript selector"

$M[2] := ....$

> $M[3] := .....$

Error, Got internal error in Typesetting:-Parse : "invalid subscript selector"

$M[3] := ....$

>