
neo-hookean

```
In[1]:= F = {{x00, x01, x02}, {x10, x11, x12}, {x20, x21, x22}};
j = Det[F];
trace = Tr[Transpose[F].F];

psi = C * (trace / Power[j, 2/3] - 3) + D * (j - 1)^2;

psiPrint = psi;
psiPrint = psiPrint /. j -> J;
psiPrint = psiPrint /. trace -> tr;
psiPrint
```

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Out[8]=  $D(-1 + J)^2 + C\left(-3 + \frac{\text{tr}}{J^{2/3}}\right)$ 
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hessian

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In[9]:= dpsi2 = Function[{x1, x2}, D[psi, x1, x2]];
dpsi2Mapx1 = Function[x1, Map[dpsi2[x1, #] &, Flatten[F]]];
H = Map[dpsi2Mapx1, Flatten[F]];

HPrint = H;
HPrint = HPrint /. j -> J;
HPrint = HPrint /. trace -> tr;
HPrint = Map[Grid[Transpose[{{#}}, {Frame -> All, Spacings -> 1.5 {1, 1}}] &, HPrint];

printStats = Function[i, Print[]; Print[i - 1]; Print[HPrint[[i]]];
Do[printStats[i], {i, 9}]
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$2 D (-x_{12} x_{21} + x_{11} x_{22})^2 + C \left(\frac{2}{j^{2/3}} - \frac{8 x_{00} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (-x_{12} x_{21} + x_{11} x_{22})^2}{9 j^{8/3}} \right)$
$2 D (x_{12} x_{20} - x_{10} x_{22}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(-\frac{4 x_{00} (x_{12} x_{20} - x_{10} x_{22})}{3 j^{5/3}} - \frac{4 x_{01} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (x_{12} x_{20} - x_{10} x_{22}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} \right)$
$2 D (-x_{11} x_{20} + x_{10} x_{21}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(-\frac{4 x_{00} (-x_{11} x_{20} + x_{10} x_{21})}{3 j^{5/3}} - \frac{4 x_{02} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} \right)$
$2 D (x_{02} x_{21} - x_{01} x_{22}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(-\frac{4 x_{00} (x_{02} x_{21} - x_{01} x_{22})}{3 j^{5/3}} - \frac{4 x_{10} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{21} - x_{01} x_{22}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} \right)$
$2 D (-1 + J) x_{22} + 2 D (-x_{02} x_{20} + x_{00} x_{22}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(-\frac{2 \operatorname{tr} x_{22}}{3 j^{5/3}} - \frac{4 x_{00} (-x_{02} x_{20} + x_{00} x_{22})}{3 j^{5/3}} - \frac{4 x_{11} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} \right)$
$-2 D (-1 + J) x_{21} + 2 D (x_{01} x_{20} - x_{00} x_{21}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(\frac{2 \operatorname{tr} x_{21}}{3 j^{5/3}} - \frac{4 x_{00} (x_{01} x_{20} - x_{00} x_{21})}{3 j^{5/3}} - \frac{4 x_{12} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (x_{01} x_{20} - x_{00} x_{21}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} \right)$
$2 D (-x_{02} x_{11} + x_{01} x_{12}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(-\frac{4 x_{00} (-x_{02} x_{11} + x_{01} x_{12})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{11} + x_{01} x_{12}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} - \frac{4 x_{20} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} \right)$
$-2 D (-1 + J) x_{12} + 2 D (x_{02} x_{10} - x_{00} x_{12}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(\frac{2 \operatorname{tr} x_{12}}{3 j^{5/3}} - \frac{4 x_{00} (x_{02} x_{10} - x_{00} x_{12})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{10} - x_{00} x_{12}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} - \frac{4 x_{21} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} \right)$
$2 D (-1 + J) x_{11} + 2 D (-x_{01} x_{10} + x_{00} x_{11}) (-x_{12} x_{21} + x_{11} x_{22}) + C \left(-\frac{2 \operatorname{tr} x_{11}}{3 j^{5/3}} - \frac{4 x_{00} (-x_{01} x_{10} + x_{00} x_{11})}{3 j^{5/3}} + \frac{10 \operatorname{tr} (-x_{01} x_{10} + x_{00} x_{11}) (-x_{12} x_{21} + x_{11} x_{22})}{9 j^{8/3}} - \frac{4 x_{22} (-x_{12} x_{21} + x_{11} x_{22})}{3 j^{5/3}} \right)$

$2 D (x_{12} x_{20} - x_{10} x_{22}) (-x_{12} x_{21} + x_{11} x_{22}) +$ $C \left(-\frac{4 x_{00} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} - \frac{4 x_{01} (-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{12} x_{20} - x_{10} x_{22}) (-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} \right)$
$2 D (x_{12} x_{20} - x_{10} x_{22})^2 + C \left(\frac{2}{J^{2/3}} - \frac{8 x_{01} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{12} x_{20} - x_{10} x_{22})^2}{9 J^{8/3}} \right)$
$2 D (-x_{11} x_{20} + x_{10} x_{21}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{4 x_{01} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$-2 D (-1 + J) x_{22} + 2 D (x_{02} x_{21} - x_{01} x_{22}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{22}}{3 J^{5/3}} - \frac{4 x_{01} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} - \frac{4 x_{10} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{21} - x_{01} x_{22}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{02} x_{20} + x_{00} x_{22}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{4 x_{01} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} - \frac{4 x_{11} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$2 D (-1 + J) x_{20} + 2 D (x_{01} x_{20} - x_{00} x_{21}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{20}}{3 J^{5/3}} - \frac{4 x_{01} (x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{01} x_{20} - x_{00} x_{21}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$2 D (-1 + J) x_{12} + 2 D (-x_{02} x_{11} + x_{01} x_{12}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{12}}{3 J^{5/3}} - \frac{4 x_{01} (-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{11} + x_{01} x_{12}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} - \frac{4 x_{20} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} \right)$
$2 D (x_{02} x_{10} - x_{00} x_{12}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{4 x_{01} (x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{10} - x_{00} x_{12}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} - \frac{4 x_{21} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} \right)$
$-2 D (-1 + J) x_{10} + 2 D (-x_{01} x_{10} + x_{00} x_{11}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{10}}{3 J^{5/3}} - \frac{4 x_{01} (-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{01} x_{10} + x_{00} x_{11}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} - \frac{4 x_{22} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} \right)$

$2 D (-x_{11} x_{20} + x_{10} x_{21}) (-x_{12} x_{21} + x_{11} x_{22}) +$ $C \left(-\frac{4 x_{00} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{11} x_{20} + x_{10} x_{21}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{4 x_{01} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{11} x_{20} + x_{10} x_{21})^2 + C \left(\frac{2}{J^{2/3}} - \frac{8 x_{02} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21})^2}{9 J^{8/3}} \right)$
$2 D (-1 + J) x_{21} + 2 D (-x_{11} x_{20} + x_{10} x_{21}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{21}}{3 J^{5/3}} - \frac{4 x_{10} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} \right)$
$-2 D (-1 + J) x_{20} + 2 D (-x_{11} x_{20} + x_{10} x_{21}) (-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{20}}{3 J^{5/3}} - \frac{4 x_{11} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} \right)$
$2 D (x_{01} x_{20} - x_{00} x_{21}) (-x_{11} x_{20} + x_{10} x_{21}) +$ $C \left(-\frac{4 x_{02} (x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{01} x_{20} - x_{00} x_{21}) (-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} \right)$
$-2 D (-1 + J) x_{11} + 2 D (-x_{02} x_{11} + x_{01} x_{12}) (-x_{11} x_{20} + x_{10} x_{21}) +$ $C \left(\frac{2 \operatorname{tr} x_{11}}{3 J^{5/3}} - \frac{4 x_{02} (-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{11} + x_{01} x_{12}) (-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} - \frac{4 x_{20} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} \right)$
$2 D (-1 + J) x_{10} + 2 D (x_{02} x_{10} - x_{00} x_{12}) (-x_{11} x_{20} + x_{10} x_{21}) +$ $C \left(-\frac{2 \operatorname{tr} x_{10}}{3 J^{5/3}} - \frac{4 x_{02} (x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{10} - x_{00} x_{12}) (-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} - \frac{4 x_{21} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} \right)$
$2 D (-x_{01} x_{10} + x_{00} x_{11}) (-x_{11} x_{20} + x_{10} x_{21}) +$ $C \left(-\frac{4 x_{02} (-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{01} x_{10} + x_{00} x_{11}) (-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} - \frac{4 (-x_{11} x_{20} + x_{10} x_{21}) x_{22}}{3 J^{5/3}} \right)$

$2 D (x_{02} x_{21} - x_{01} x_{22}) (-x_{12} x_{21} + x_{11} x_{22}) +$ $C \left(-\frac{4 x_{00} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} - \frac{4 x_{10} (-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{21} - x_{01} x_{22}) (-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} \right)$
$-2 D (-1 + J) x_{22} + 2 D (x_{02} x_{21} - x_{01} x_{22}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{22}}{3 J^{5/3}} - \frac{4 x_{01} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} - \frac{4 x_{10} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{21} - x_{01} x_{22}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$2 D (-1 + J) x_{21} + 2 D (-x_{11} x_{20} + x_{10} x_{21}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{21}}{3 J^{5/3}} - \frac{4 x_{10} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} \right)$
$2 D (x_{02} x_{21} - x_{01} x_{22})^2 + C \left(\frac{2}{J^{2/3}} - \frac{8 x_{10} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{21} - x_{01} x_{22})^2}{9 J^{8/3}} \right)$
$2 D (-x_{02} x_{20} + x_{00} x_{22}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{4 x_{10} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} - \frac{4 x_{11} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} \right)$
$2 D (x_{01} x_{20} - x_{00} x_{21}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{4 x_{10} (x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{01} x_{20} - x_{00} x_{21}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{02} x_{11} + x_{01} x_{12}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{4 x_{10} (-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{11} + x_{01} x_{12}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} - \frac{4 x_{20} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} \right)$
$2 D (-1 + J) x_{02} + 2 D (x_{02} x_{10} - x_{00} x_{12}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{02}}{3 J^{5/3}} - \frac{4 x_{10} (x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{10} - x_{00} x_{12}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} - \frac{4 x_{21} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} \right)$
$-2 D (-1 + J) x_{01} + 2 D (-x_{01} x_{10} + x_{00} x_{11}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{01}}{3 J^{5/3}} - \frac{4 x_{10} (-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{01} x_{10} + x_{00} x_{11}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} - \frac{4 x_{22} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} \right)$

$2 D (-1 + J) x_{22} + 2 D (-x_{02} x_{20} + x_{00} x_{22}) (-x_{12} x_{21} + x_{11} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{22}}{3 J^{5/3}} - \frac{4 x_{00} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} - \frac{4 x_{11} (-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22}) (-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{02} x_{20} + x_{00} x_{22}) (x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{4 x_{01} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} - \frac{4 x_{11} (x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22}) (x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} \right)$
$-2 D (-1 + J) x_{20} + 2 D (-x_{11} x_{20} + x_{10} x_{21}) (-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{20}}{3 J^{5/3}} - \frac{4 x_{11} (-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} - \frac{4 x_{02} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{11} x_{20} + x_{10} x_{21}) (-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{02} x_{20} + x_{00} x_{22}) (x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{4 x_{10} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} - \frac{4 x_{11} (x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22}) (x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} \right)$
$2 D (-x_{02} x_{20} + x_{00} x_{22})^2 + C \left(\frac{2}{J^{2/3}} - \frac{8 x_{11} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{20} + x_{00} x_{22})^2}{9 J^{8/3}} \right)$
$2 D (x_{01} x_{20} - x_{00} x_{21}) (-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(-\frac{4 x_{11} (x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{01} x_{20} - x_{00} x_{21}) (-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} \right)$
$-2 D (-1 + J) x_{02} + 2 D (-x_{02} x_{11} + x_{01} x_{12}) (-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{02}}{3 J^{5/3}} - \frac{4 x_{11} (-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{02} x_{11} + x_{01} x_{12}) (-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} - \frac{4 x_{20} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} \right)$
$2 D (x_{02} x_{10} - x_{00} x_{12}) (-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(-\frac{4 x_{11} (x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (x_{02} x_{10} - x_{00} x_{12}) (-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} - \frac{4 x_{21} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} \right)$
$2 D (-1 + J) x_{00} + 2 D (-x_{01} x_{10} + x_{00} x_{11}) (-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{00}}{3 J^{5/3}} - \frac{4 x_{11} (-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr} (-x_{01} x_{10} + x_{00} x_{11}) (-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} - \frac{4 x_{22} (-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} \right)$

$-2 D(-1+J) x_{21} + 2 D(x_{01} x_{20} - x_{00} x_{21})(-x_{12} x_{21} + x_{11} x_{22}) +$ $C\left(\frac{2 \operatorname{tr} x_{21}}{3 J^{5/3}} - \frac{4 x_{00}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12}(-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{01} x_{20} - x_{00} x_{21})(-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}}\right)$
$2 D(-1+J) x_{20} + 2 D(x_{01} x_{20} - x_{00} x_{21})(x_{12} x_{20} - x_{10} x_{22}) +$ $C\left(-\frac{2 \operatorname{tr} x_{20}}{3 J^{5/3}} - \frac{4 x_{01}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12}(x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{01} x_{20} - x_{00} x_{21})(x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}}\right)$
$2 D(x_{01} x_{20} - x_{00} x_{21})(-x_{11} x_{20} + x_{10} x_{21}) +$ $C\left(-\frac{4 x_{02}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12}(-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{01} x_{20} - x_{00} x_{21})(-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}}\right)$
$2 D(x_{01} x_{20} - x_{00} x_{21})(x_{02} x_{21} - x_{01} x_{22}) +$ $C\left(-\frac{4 x_{10}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12}(x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{01} x_{20} - x_{00} x_{21})(x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}}\right)$
$2 D(x_{01} x_{20} - x_{00} x_{21})(-x_{02} x_{20} + x_{00} x_{22}) +$ $C\left(-\frac{4 x_{11}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} - \frac{4 x_{12}(-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{01} x_{20} - x_{00} x_{21})(-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}}\right)$
$2 D(x_{01} x_{20} - x_{00} x_{21})^2 + C\left(\frac{2}{J^{2/3}} - \frac{8 x_{12}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{01} x_{20} - x_{00} x_{21})^2}{9 J^{8/3}}\right)$
$2 D(-1+J) x_{01} + 2 D(-x_{02} x_{11} + x_{01} x_{12})(x_{01} x_{20} - x_{00} x_{21}) +$ $C\left(-\frac{2 \operatorname{tr} x_{01}}{3 J^{5/3}} - \frac{4 x_{12}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(x_{01} x_{20} - x_{00} x_{21})}{9 J^{8/3}} - \frac{4 x_{20}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}}\right)$
$-2 D(-1+J) x_{00} + 2 D(x_{02} x_{10} - x_{00} x_{12})(x_{01} x_{20} - x_{00} x_{21}) +$ $C\left(\frac{2 \operatorname{tr} x_{00}}{3 J^{5/3}} - \frac{4 x_{12}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(x_{01} x_{20} - x_{00} x_{21})}{9 J^{8/3}} - \frac{4 x_{21}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}}\right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(x_{01} x_{20} - x_{00} x_{21}) +$ $C\left(-\frac{4(-x_{01} x_{10} + x_{00} x_{11}) x_{12}}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(x_{01} x_{20} - x_{00} x_{21})}{9 J^{8/3}} - \frac{4(x_{01} x_{20} - x_{00} x_{21}) x_{22}}{3 J^{5/3}}\right)$

$2 D(-x_{02} x_{11} + x_{01} x_{12})(-x_{12} x_{21} + x_{11} x_{22}) +$ $C \left(-\frac{4 x_{00}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} - \frac{4 x_{20}(-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} \right)$
$2 D(-1 + J) x_{12} + 2 D(-x_{02} x_{11} + x_{01} x_{12})(x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{12}}{3 J^{5/3}} - \frac{4 x_{01}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} - \frac{4 x_{20}(x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} \right)$
$-2 D(-1 + J) x_{11} + 2 D(-x_{02} x_{11} + x_{01} x_{12})(-x_{11} x_{20} + x_{10} x_{21}) +$ $C \left(\frac{2 \operatorname{tr} x_{11}}{3 J^{5/3}} - \frac{4 x_{02}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} - \frac{4 x_{20}(-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}} \right)$
$2 D(-x_{02} x_{11} + x_{01} x_{12})(x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(-\frac{4 x_{10}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} - \frac{4 x_{20}(x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} \right)$
$-2 D(-1 + J) x_{02} + 2 D(-x_{02} x_{11} + x_{01} x_{12})(-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{02}}{3 J^{5/3}} - \frac{4 x_{11}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} - \frac{4 x_{20}(-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} \right)$
$2 D(-1 + J) x_{01} + 2 D(-x_{02} x_{11} + x_{01} x_{12})(x_{01} x_{20} - x_{00} x_{21}) +$ $C \left(-\frac{2 \operatorname{tr} x_{01}}{3 J^{5/3}} - \frac{4 x_{12}(-x_{02} x_{11} + x_{01} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})(x_{01} x_{20} - x_{00} x_{21})}{9 J^{8/3}} - \frac{4 x_{20}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}} \right)$
$2 D(-x_{02} x_{11} + x_{01} x_{12})^2 + C \left(\frac{2}{J^{2/3}} + \frac{10 \operatorname{tr}(-x_{02} x_{11} + x_{01} x_{12})^2}{9 J^{8/3}} - \frac{8(-x_{02} x_{11} + x_{01} x_{12}) x_{20}}{3 J^{5/3}} \right)$
$2 D(x_{02} x_{10} - x_{00} x_{12})(-x_{02} x_{11} + x_{01} x_{12}) +$ $C \left(\frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(-x_{02} x_{11} + x_{01} x_{12})}{9 J^{8/3}} - \frac{4(x_{02} x_{10} - x_{00} x_{12}) x_{20}}{3 J^{5/3}} - \frac{4(-x_{02} x_{11} + x_{01} x_{12}) x_{21}}{3 J^{5/3}} \right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(-x_{02} x_{11} + x_{01} x_{12}) +$ $C \left(\frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(-x_{02} x_{11} + x_{01} x_{12})}{9 J^{8/3}} - \frac{4(-x_{01} x_{10} + x_{00} x_{11}) x_{20}}{3 J^{5/3}} - \frac{4(-x_{02} x_{11} + x_{01} x_{12}) x_{22}}{3 J^{5/3}} \right)$

$-2 D(-1+J) x_{12} + 2 D(x_{02} x_{10} - x_{00} x_{12})(-x_{12} x_{21} + x_{11} x_{22}) +$ $C\left(\frac{2 \operatorname{tr} x_{12}}{3 J^{5/3}} - \frac{4 x_{00}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} - \frac{4 x_{21}(-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}}\right)$
$2 D(x_{02} x_{10} - x_{00} x_{12})(x_{12} x_{20} - x_{10} x_{22}) +$ $C\left(-\frac{4 x_{01}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} - \frac{4 x_{21}(x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}}\right)$
$2 D(-1+J) x_{10} + 2 D(x_{02} x_{10} - x_{00} x_{12})(-x_{11} x_{20} + x_{10} x_{21}) +$ $C\left(-\frac{2 \operatorname{tr} x_{10}}{3 J^{5/3}} - \frac{4 x_{02}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} - \frac{4 x_{21}(-x_{11} x_{20} + x_{10} x_{21})}{3 J^{5/3}}\right)$
$2 D(-1+J) x_{02} + 2 D(x_{02} x_{10} - x_{00} x_{12})(x_{02} x_{21} - x_{01} x_{22}) +$ $C\left(-\frac{2 \operatorname{tr} x_{02}}{3 J^{5/3}} - \frac{4 x_{10}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} - \frac{4 x_{21}(x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}}\right)$
$2 D(x_{02} x_{10} - x_{00} x_{12})(-x_{02} x_{20} + x_{00} x_{22}) +$ $C\left(-\frac{4 x_{11}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} - \frac{4 x_{21}(-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}}\right)$
$-2 D(-1+J) x_{00} + 2 D(x_{02} x_{10} - x_{00} x_{12})(x_{01} x_{20} - x_{00} x_{21}) +$ $C\left(\frac{2 \operatorname{tr} x_{00}}{3 J^{5/3}} - \frac{4 x_{12}(x_{02} x_{10} - x_{00} x_{12})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(x_{01} x_{20} - x_{00} x_{21})}{9 J^{8/3}} - \frac{4 x_{21}(x_{01} x_{20} - x_{00} x_{21})}{3 J^{5/3}}\right)$
$2 D(x_{02} x_{10} - x_{00} x_{12})(-x_{02} x_{11} + x_{01} x_{12}) +$ $C\left(\frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})(-x_{02} x_{11} + x_{01} x_{12})}{9 J^{8/3}} - \frac{4(x_{02} x_{10} - x_{00} x_{12}) x_{20}}{3 J^{5/3}} - \frac{4(-x_{02} x_{11} + x_{01} x_{12}) x_{21}}{3 J^{5/3}}\right)$
$2 D(x_{02} x_{10} - x_{00} x_{12})^2 + C\left(\frac{2}{J^{2/3}} + \frac{10 \operatorname{tr}(x_{02} x_{10} - x_{00} x_{12})^2}{9 J^{8/3}} - \frac{8(x_{02} x_{10} - x_{00} x_{12}) x_{21}}{3 J^{5/3}}\right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(x_{02} x_{10} - x_{00} x_{12}) +$ $C\left(\frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(x_{02} x_{10} - x_{00} x_{12})}{9 J^{8/3}} - \frac{4(-x_{01} x_{10} + x_{00} x_{11}) x_{21}}{3 J^{5/3}} - \frac{4(x_{02} x_{10} - x_{00} x_{12}) x_{22}}{3 J^{5/3}}\right)$

$2 D(-1 + J) x_{11} + 2 D(-x_{01} x_{10} + x_{00} x_{11})(-x_{12} x_{21} + x_{11} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{11}}{3 J^{5/3}} - \frac{4 x_{00}(-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(-x_{12} x_{21} + x_{11} x_{22})}{9 J^{8/3}} - \frac{4 x_{22}(-x_{12} x_{21} + x_{11} x_{22})}{3 J^{5/3}} \right)$
$-2 D(-1 + J) x_{10} + 2 D(-x_{01} x_{10} + x_{00} x_{11})(x_{12} x_{20} - x_{10} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{10}}{3 J^{5/3}} - \frac{4 x_{01}(-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(x_{12} x_{20} - x_{10} x_{22})}{9 J^{8/3}} - \frac{4 x_{22}(x_{12} x_{20} - x_{10} x_{22})}{3 J^{5/3}} \right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(-x_{11} x_{20} + x_{10} x_{21}) +$ $C \left(-\frac{4 x_{02}(-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(-x_{11} x_{20} + x_{10} x_{21})}{9 J^{8/3}} - \frac{4(-x_{11} x_{20} + x_{10} x_{21}) x_{22}}{3 J^{5/3}} \right)$
$-2 D(-1 + J) x_{01} + 2 D(-x_{01} x_{10} + x_{00} x_{11})(x_{02} x_{21} - x_{01} x_{22}) +$ $C \left(\frac{2 \operatorname{tr} x_{01}}{3 J^{5/3}} - \frac{4 x_{10}(-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(x_{02} x_{21} - x_{01} x_{22})}{9 J^{8/3}} - \frac{4 x_{22}(x_{02} x_{21} - x_{01} x_{22})}{3 J^{5/3}} \right)$
$2 D(-1 + J) x_{00} + 2 D(-x_{01} x_{10} + x_{00} x_{11})(-x_{02} x_{20} + x_{00} x_{22}) +$ $C \left(-\frac{2 \operatorname{tr} x_{00}}{3 J^{5/3}} - \frac{4 x_{11}(-x_{01} x_{10} + x_{00} x_{11})}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(-x_{02} x_{20} + x_{00} x_{22})}{9 J^{8/3}} - \frac{4 x_{22}(-x_{02} x_{20} + x_{00} x_{22})}{3 J^{5/3}} \right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(x_{01} x_{20} - x_{00} x_{21}) +$ $C \left(-\frac{4(-x_{01} x_{10} + x_{00} x_{11}) x_{12}}{3 J^{5/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(x_{01} x_{20} - x_{00} x_{21})}{9 J^{8/3}} - \frac{4(x_{01} x_{20} - x_{00} x_{21}) x_{22}}{3 J^{5/3}} \right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(-x_{02} x_{11} + x_{01} x_{12}) +$ $C \left(\frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(-x_{02} x_{11} + x_{01} x_{12})}{9 J^{8/3}} - \frac{4(-x_{01} x_{10} + x_{00} x_{11}) x_{20}}{3 J^{5/3}} - \frac{4(-x_{02} x_{11} + x_{01} x_{12}) x_{22}}{3 J^{5/3}} \right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})(x_{02} x_{10} - x_{00} x_{12}) +$ $C \left(\frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})(x_{02} x_{10} - x_{00} x_{12})}{9 J^{8/3}} - \frac{4(-x_{01} x_{10} + x_{00} x_{11}) x_{21}}{3 J^{5/3}} - \frac{4(x_{02} x_{10} - x_{00} x_{12}) x_{22}}{3 J^{5/3}} \right)$
$2 D(-x_{01} x_{10} + x_{00} x_{11})^2 + C \left(\frac{2}{J^{2/3}} + \frac{10 \operatorname{tr}(-x_{01} x_{10} + x_{00} x_{11})^2}{9 J^{8/3}} - \frac{8(-x_{01} x_{10} + x_{00} x_{11}) x_{22}}{3 J^{5/3}} \right)$