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> restart;with(Riemann):with(TensorPack): with(Canon):CDF(0): CDS(index):

Chapter XX Tensor analysis using indices - Senovilla et al. - Shearfree for acceleration parallel to vorticity if $\sigma_{ab}=0 \Rightarrow \omega\Theta=0$

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eq73 - omega[a,b]*cod(-a) contraction of SSSeq72

> **read** "EFE" : **read** "SFE" :**read** "fids" :**read** "Seneqs80" :

>

> $SSSeq73 := 2\cdot\left(1+\Psi^2\right)\cdot \grave{p}' + \left(3\cdot\left(\dfrac{\grave{p}'}{Psi}\right)^2 + \dfrac{1}{3} - \dfrac{(mu+p)\cdot \grave{p}''}{\grave{p}'}\right)\cdot\Psi^2 = 0 : T(\%);$

>

from SSSeq72c

> $temp := ((-12*PU*\grave{p}'' + 24*\grave{p}'^{\wedge}2 + 4*\grave{p}')*Psi^{\wedge}4 + (36*\grave{p}'^{\wedge}3 + 24*\grave{p}'^{\wedge}2)*Psi^{\wedge}2)*omega*omega[-A]*omega[a,b] = 0 : T(\%);$

$$\left(\left(-12\,PU p'' + 24\,p^2 + 4\,p'\right)\Psi^4 + \left(36\,p^3 + 24\,p^2\right)\Psi^2\right)\omega\,\omega_{;a}\,\omega^{`a`b} = 0 \qquad (1.1)$$

>

so either

> $temp1 := op(1, op(1, temp)) = 0 : T(\%);$

$$\left(-12\,PU p'' + 24\,p^2 + 4\,p'\right)\Psi^4 + \left(36\,p^3 + 24\,p^2\right)\Psi^2 = 0 \qquad (1.2)$$

OR

> $temp2 := op(2, op(1, temp))\cdot op(3, op(1, temp))\,op(4, op(1, temp)) = 0 : T(\%);$

$$\omega\,\omega_{;a}\,\omega^{`a`b} = 0 \qquad (1.3)$$

Looking at temp1

> $temp6 := collect\left(expand\left(\dfrac{TEDS(PU=p+mu, temp1)}{12\cdot\Psi^2\cdot \grave{p}'}\right), [Psi, \grave{p}']\right) : T(\%);$

$$\left(\dfrac{1}{3} + 2\,p' + \dfrac{-\mu p'' - p\,p''}{p'}\right)\Psi^2 + 3\,p^2 + 2\,p' = 0 \qquad (1.4)$$

>

> $SSSeq73 := 2\cdot\left(1+\Psi^2\right)\cdot \grave{p}' + \left(3\cdot\left(\dfrac{\grave{p}'}{Psi}\right)^2 + \dfrac{1}{3} - \dfrac{(mu+p)\cdot \grave{p}''}{\grave{p}'}\right)\cdot\Psi^2 = 0 : T(\%);$

$$2\left(\Psi^2 + 1\right)p' + \left(\dfrac{3\,p^2}{\Psi^2} + \dfrac{1}{3} - \dfrac{(\mu+p)\,p''}{p'}\right)\Psi^2 = 0 \qquad (1.5)$$

>

Now comparing temp6 and SSSeq73:

> $expand(lhs(temp6) - lhs(SSSeq73)) : T(\%);$

(1.6)

$$0 \tag{1.6}$$

proof completed