378(1): Spin Connections for Forward Precession

In ~~this case~~ the acceleration due to gravity is:

$$\underline{g} = \underline{\ddot{r}} = \frac{MG}{\gamma r^3}\left(\frac{\underline{\dot{r}}(\underline{\dot{r}}\cdot\underline{r})}{c^2} - \underline{r}\right) \quad -(1)$$

and the relevant gravitational field equations are:

$$\underline{\nabla}\cdot\underline{g} = \underline{\kappa}\cdot\underline{g} = 4\pi G \rho_M \quad -(2)$$

and

$$\underline{\nabla}\times\underline{\kappa} = \underline{\kappa}\times\underline{g} = \underline{0} \quad -(3)$$

Eq. (3) means that $\underline{\kappa}$ is parallel to $\underline{g}$ and:

$$\underline{\kappa} = \frac{1}{v_0^2}\,\underline{g} \quad -(4)$$

where v_0 is a velocity to be determined. It follows that

$$\underline{\nabla}\cdot\underline{g} = v_0^2\kappa^2 \quad -(5)$$

so

$$v_0^2 = \frac{1}{\kappa^2}\,\underline{\nabla}\cdot\underline{g} \quad -(6)$$

The kappa vector is:

$$\underline{\kappa} = \frac{1}{v_0^2}\frac{MG}{\gamma r^3}\left(\frac{\underline{\dot{r}}(\underline{\dot{r}}\cdot\underline{r})}{c^2} - \underline{r}\right) \quad -(7)$$

From eqs. (4) and (6):

$$\boxed{\underline{\kappa} = \frac{\kappa^2\,\underline{g}}{\underline{\nabla}\cdot\underline{g}}} \quad -(8)$$

2) and

$$\boxed{\frac{\underline{g}}{\underline{\nabla}\cdot\underline{g}} = \frac{\kappa}{\kappa^2}} \quad -(9)$$

The acceleration due to gravity is determined by the spin connection contained in the kappa vector. Therefore eq. (9) can be developed with computer algebra for forward processing results.

In the non relativistic limit:

$$\underline{g} = g_X \underline{i} + g_Y \underline{k} \quad -(10)$$

where

$$g_X = -\frac{mGX}{(X^2+Y^2)^{3/2}} \quad -(11)$$

$$g_Y = -\frac{mGY}{(X^2+Y^2)^{3/2}} \quad -(12)$$

and

$$\underline{\nabla}\cdot\underline{g} = \frac{\partial g_X}{\partial X} + \frac{\partial g_Y}{\partial Y} = \frac{mG}{(X^2+Y^2)^{3/2}} \quad -(13)$$

So

$$\frac{\kappa_X}{\kappa_X^2+\kappa_Y^2} = -X \quad -(14)$$

$$\frac{\kappa_Y}{\kappa_X^2+\kappa_Y^2} = -Y \quad -(15)$$

This is the result found in UFT377, Q.E.D.

It can now be extended for $\underline{g}$ defined by eq. (1).