1) 108(5): Equivalence of Inertial and Gravitational Mass, ECE Explanation.

The inertial mass is that mass that determines the acceleration of a particle under the action of a given force. The gravitational mass determines the gravitational force between two particles. The weak equivalence principle can be stated as:

$$F = mg = -\frac{mMG}{r^2} \quad -(1)$$

i.e.

$$g = -\frac{MG}{r^2} \quad -(2)$$

where G is Newton's universal constant of gravitation.

In these equations:

$$g = -\nabla \Phi \quad -(3)$$

where:

$$\Phi = -\frac{GM}{r} \quad -(4)$$

is the gravitational potential. The potential energy is:

$$U = m\Phi \quad -(5)$$

In ECE a straightforward explanation for the equivalence principle is given as follows. This is an explanation for why the gravitational and inertial mass is the same to less than $1 : 10^{12}$.

In ECE:

$$g = Tc^2 \quad -(6)$$

$$\left|\frac{T}{R}\right| = \frac{2MG}{c^2} \quad -(7)$$

Therefore eq. (2) follows from eqs. (6) and (7) if:

$$c^2 T = \frac{c^2}{2} \frac{T}{R} \cdot \frac{1}{r^2} \quad -(8)$$

i.e $$\boxed{R = \frac{1}{2r^2}} \quad -(9)$$

Now use: $$-\frac{T}{R} = r_s = \frac{2MG}{c^2} \quad -(10)$$

so from eqs. (9) and (10):

$$\boxed{T = -\frac{r_s}{2r^2}} \quad -(11)$$

Therefore the fundamental reason why m is the same on both sides of eq (1) is that the curvature and torsion are given by eqs. (9) and (11)

Conclusion

The equivalence principle is due to the fact that curvature and torsion both have an inverse square dependence on the radial coordinate r. Therefore the Pioneer / Cassini anomaly is due to the fact that r_s slightly deviates from $2MG / c^2$. The anomaly does not violate the equivalence principle.
