A formal derivation of the proportionality, $\frac{-\partial P_A(M,r)}{\partial M} \propto 1/M^2$, for " large objects".

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From the property of $P_A(M,r)$, $\lim_{M \to \infty} P_A(M,r) \to 1$, we define "large objects" as those where $P_A(M,r) \simeq 1$. For these objects the modified Newton's law for gravitation,

$$F(M,r) = GM/r^2 \{2P_A(M,r) - 1\} \quad \text{equation \#1}$$

becomes,

$$F(M,r) \simeq G\,M/r^2 \quad \text{equation \#2}$$

Taking equation # 1 we have,

$$\frac{\partial F(M,r)}{\partial M} = G\frac{M}{r^2}\left\{2\frac{\partial P_A}{\partial M}(M,r)\right\} + \frac{G}{r^2}\left\{2P_A(M,r) - 1\right\}$$

$$= G\frac{M}{r^2}\left\{2\frac{\partial P_A(M,r)}{\partial M}\right\} + \frac{F(M,r)}{M}$$

$$\Rightarrow -\frac{\partial P_A(M,r)}{\partial M} = \frac{r^2}{2GM}\left\{\frac{F(M,r)}{M} - \frac{\partial F(M,r)}{\partial M}\right\} \quad \text{equation \#3}$$

From equation # 2 we get,

$$\frac{\partial F(M,r)}{\partial M} \simeq G/r^2$$

or

$$\frac{\partial F(M,r)}{\partial M} \simeq \frac{F(M,r)}{M} \quad \text{equation \#4}$$

From equation # 4 we get,

$$\frac{F(m,r)}{m} - \frac{\partial F(m,r)}{\partial m} \simeq 0,$$

which leads to,

$$\frac{F(m,r)}{m} - \frac{\partial F(m,r)}{\partial m} = \epsilon/M \quad \text{equation \# 5}$$

where ϵ is an extremely small quantity, i.e $\epsilon \simeq 0$.

Substituting equation # 5 into equation # 3, we get

$$-\frac{\partial P_A(M,r)}{\partial m} = \frac{r^2 \epsilon}{2GM^2}$$

This leads to our proportionality $-\frac{\partial P_A(m,r)}{\partial m} \propto 1/M^2$ for " large objects " and the implications discussed in the " An addendum to the theory " On the consequences of a probabilistic space-time continuum" paper". Additionally, we can also conclude from this proportionality that the larger the mass 'M' of an object, the slower is the rate of decline of P_A (M,r).

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