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English Royal Society Physicist Most in Error, Sir Isaac Newton

The Mathematical proof

By Professor Joe Nahhas 1976

Abstract: Newton's most famous equation is wrong: $\mathbf{F} = [- G\, m\, M/r^2]\, \mathbf{r}_{(1)}$

Proof:

All there is in the Universe is objects of mass m moving in space (x, y, z) at a location $\mathbf{r} = \mathbf{r}(x, y, z)$. The state of any object in the Universe can be expressed as the product

$\mathbf{S} = m\,\mathbf{r}$; State = mass x location:

$\mathbf{P} = d\,\mathbf{S}/d\,t = m\,(d\,\mathbf{r}/d\,t) + (dm/d\,t)\,\mathbf{r}$ = Total moment

= change of location + change of mass

$= m\,v + m'\,r$; v = velocity = $d\,r/d\,t$; m' = mass change rate

$\mathbf{F} = d\,\mathbf{P}/d\,t = d^2\mathbf{S}/dt^2$ = Total force

$= m\,(d^2\mathbf{r}/dt^2) + 2(dm/d\,t)\,(d\,\mathbf{r}/d\,t) + (d^2m/dt^2)\,\mathbf{r}$

$= m\,\boldsymbol{\gamma} + 2m'\mathbf{v} + m''\,\mathbf{r}$; γ = acceleration; m'' = mass acceleration rate

<u>In polar coordinates system</u>

$\mathbf{r} = r\,\mathbf{r}_{(1)}$; $\mathbf{v} = r'\,\mathbf{r}_{(1)} + r\,\theta'\,\boldsymbol{\theta}_{(1)}$; $\boldsymbol{\gamma} = (r'' - r\theta'^2)\mathbf{r}_{(1)} + (2r'\theta' + r\,\theta'')\boldsymbol{\theta}_{(1)}$

$\mathbf{r}$ = location; $\mathbf{v}$ = velocity; $\boldsymbol{\gamma}$ = acceleration

$\mathbf{F} = m\,\boldsymbol{\gamma} + 2m'\mathbf{v} + m''\,\mathbf{r}$

$\mathbf{F} = m\,[(r''-r\theta'^2)\,\mathbf{r}_{(1)} + (2r'\theta' + r\,\theta'')\,\boldsymbol{\theta}_{(1)}] + 2m'[r'\,\mathbf{r}_{(1)} + r\,\theta'\,\boldsymbol{\theta}_{(1)}] + (m''\,r)\,\mathbf{r}_{(1)}$

$= [d^2\,(m\,r)/dt^2 - (m\,r)\,\theta'^2]\,\mathbf{r}_{(1)} + (1/mr)\,[d\,(m^2r^2\theta')/d\,t]\,\boldsymbol{\theta}_{(1)}$

$= [-GmM/r^2]\,\mathbf{r}_{(1)}$ ------------------------------- Newton's Gravitational Law

Proof**:**

First $\mathbf{r} = r\,[\text{cosine}\ \theta\,\hat{\mathbf{i}} + \text{sine}\ \theta\,\hat{\mathbf{J}}] = r\,\mathbf{r}_{(1)}$

Define $\mathbf{r}_{(1)} = \text{cosine}\ \theta\,\hat{\mathbf{i}} + \text{sine}\ \theta\,\hat{\mathbf{J}}$

Define $\mathbf{v} = d\,\mathbf{r}/d\,t = r'\,\mathbf{r}_{(1)} + r\,d[\mathbf{r}_{(1)}]/d\,t$

$= r'\,\mathbf{r}_{(1)} + r\,\theta'[-\text{ sine }\theta\,\hat{\mathbf{\imath}} + \text{cosine }\theta\hat{J}]$

$= r'\,\mathbf{r}_{(1)} + r\,\theta'\,\boldsymbol{\theta}_{(1)}$

Define $\boldsymbol{\theta}_{(1)} = -\text{sine }\theta\,\hat{\imath} + \text{cosine }\theta\,\hat{J}$;

And with $\mathbf{r}_{(1)} = \text{cosine }\theta\,\hat{\imath} + \text{ sine }\theta\,\hat{J}$

Then $d\,[\boldsymbol{\theta}_{(1)}]/d\,t = \theta'\,[-\text{ cosine }\theta\,\hat{\imath} - \text{ sine }\theta\,\hat{J} = -\,\theta'\,\mathbf{r}_{(1)}$

And $d\,[\mathbf{r}_{(1)}]/d\,t = \theta'\,[-\text{sine }\theta\,\hat{\imath} + \text{ cosine }\theta\,\hat{J}] = \theta'\,\boldsymbol{\theta}_{(1)}$

Define $\boldsymbol{\gamma} = d\,[r'\,\mathbf{r}_{(1)} + r\,\theta'\,\boldsymbol{\theta}_{(1)}]\,/d\,t$

$= r''\,r_{(1)} + r'd\,[\mathbf{r}_{(1)}]/d\,t + r'\,\theta'\,\mathbf{r}_{(1)} + r\,\theta''\,\mathbf{r}_{(1)} + r\,\theta'd\,[\theta_{(1)}]/d\,t$

$\boldsymbol{\gamma} = (r'' - r\theta'^2)\,\mathbf{r}_{(1)} + (2r'\theta' + r\,\theta'')\,\boldsymbol{\theta}_{(1)}$

With $d^2\,(m\,r)/dt^2 - (m\,r)\,\theta'^2 = F\,(r)$

And $d\,(m^2r^2\theta')/d\,t = 0$

With m = constant, then

With $d^2\,r/dt^2 - r\,\theta'^2 = F\,(r)$ Eq-1

And $d\,(r^2\theta')/d\,t = 0$ Eq-2

From Eq-2: $d\,(r^2\theta')/d\,t = 0$

Then $r^2\theta' = h = \text{constant}$

Differentiate with respect to time

Then $2rr'\theta' + r^2\theta'' = 0$

Divide by $r^2\theta'$

Then $2(r'/r) + \theta''/\theta' = 0$

And $2(r'/r) = -\,\theta''/\theta' = 2[\lambda\,(r) + i\,\omega\,(r)]$

Also, $r = r\,(0)\ \text{Exp}\ [\lambda\,(r) + i\,\omega\,(r)]\,t$

And $\theta' = \theta'\,(0)\ \text{Exp}\ {-2}\,[\lambda\,(r) + i\,\omega\,(r)]\,t$

For a fixed orbit: $\lambda\,(r) = 0$

Also, $r = r\,(0)\ \text{Exp}\ i\,\omega\,(r)\,t$

And $\theta' = \theta'\,(0)\ \text{Exp}\ {-2}\,i\,\omega\,(r)\,t$

And $d^2\,r/\,d\,t^2 = -\,\omega^2\,(r)\,r$ Hooke's law

With $m\,[d^2\,r/dt^2 - r\,\theta'^2] = F\,(r) = -\,m\,f(r)$

Then $F = -\,m\,[\omega^2\,(r) + \theta'^2]\,r$ Hooke's Modified law

$= -\,m\,f\,(r)$

And $[\omega^2\,(r) + \theta'^2]\,r = f\,(r)$

At r = a and t = 0; $[\omega^2\,(a) + \theta'(0)^2]\,a = f\,(a)$

Then $[\omega^2\,(a) + \theta'(0)^2]\,a^3 = a^2\,f\,(a) = \text{constant}$

With $a^3/\,T^2 = \text{constant}$ Kepler's third law

And $[\omega^2\,(a) + \theta'(0)^2] \sim [2\,\pi/T]^2 = 4\,\pi^2/\,T^2$

Then $f\,(a) = \text{constant}/\,a^2$

And $f\,(r) = \text{constant}\,/\,r^2$ Hooke's deduction

In General:

With ω being a constant

And $[\omega^2\,(r) + \theta'^2]\,r = f\,(r)$

And $\theta' = h/r^2$

Then $f\,(r) = \omega^2\,(r)\,r + h^2/r^3$

And $m\,[d^2\,r/dt^2 - r\,\theta'^2] = F\,(r) = -\,m\,f(r) = -\,m\,[\omega^2\,(r) + \theta'^2]\,r = -\,m\,[\omega^2\,(r)\,r + h^2/r^3]$

And $F(r) = -m[\omega^2(r)r + h^2/r^3]$

Or $\mathbf{F} = -m[\omega^2(r)r + h^2/r^3]\mathbf{r}$ **(1)**

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