Here an overbar denotes a time derivative.

\[ \frac{d}{dt} \mathbf{v} = \mathbf{a} \]

where \( a \) is a constant and \( \mathbf{v} \) is the total mass per particle contained within the

radius \( r \).

\( \mathbf{F} \) in the 

radius \( r \). The constant \( a \)

is the usual unit vectors along the \( x \) and \( z \) axes. We will

\[ \mathbf{F} = \mathbf{a} \]

and

\[ \mathbf{a} = \mathbf{a} \]

\[ \mathbf{a} + \mathbf{F} \mathbf{v} = \mathbf{a} \]

We will use cylindrical coordinates, so

(2D perspective)

(3D perspective)

describe a particle of the coordinate system.

described by the coordinate system.

\[ \mathbf{F} \mathbf{r} = \mathbf{a} \]

\( \mathbf{F} \mathbf{r} \) is the net force on the particle inclines to the right.

\[ \mathbf{F} \mathbf{r} \]
The Hubble expansion, defined as a physical constant by Hubble, does not emerge from the equation of motion. The Hubble expansion, defined as a physical constant by Hubble, does not emerge from the equation of motion.

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\[ \frac{d}{dx} \left( \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} \right) + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) \]

This is the equation of motion for a particle of mass \( m \) is subject to a force \( F(x) \). If the force is a function of the position, the equation becomes a differential equation. When the force is constant, it reduces to the simple harmonic motion equation.

Suppose that the force of gravity is modeled to contain a new, repulsive term,

\[ m \frac{d^2x}{dt^2} = \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) + \frac{g(x)}{2} \]

where \( g(x) \) denotes the total mass contained initially in the region of \( x \) and

\[ \frac{d^2x}{dt^2} = \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) + \frac{g(x)}{2} \]

We denote the radius of the region of a particle which entered at radius \( r \) by the

\[ \frac{d}{dx} \left( \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} \right) + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) \]

where \( F(x) \) is the total mass contained. By differentiating the total mass of the sphere, we find

\[ \frac{d}{dx} \left( \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} \right) + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) + \frac{g(x)}{2} \]

\[ \frac{d}{dx} \left( \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} \right) + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) + \frac{g(x)}{2} \]

To make the integral of the expanding sphere, we need to integrate over the volume

\[ \int_{\rho}^{r} \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} + \frac{1}{2} \frac{1}{m} \frac{d^2x}{dt^2} = F(x) + \frac{g(x)}{2} \]

This is the equation of motion for a particle of mass \( m \) is subject to a force \( F(x) \). If the force is a function of the position, the equation becomes a differential equation. When the force is constant, it reduces to the simple harmonic motion equation.

**Problem 4.2 Gravity: Possible Modification of Newton's Law**

READ THIS: The problem was formulated as of June 10, 2015, and the solution is due on April 10, 2016.

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We understand that this is not a scientific problem, but rather a mathematical problem. The problem is formulated as follows:

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Total points for Problem Set: 85.

Determine:

equation should include terms dependent on $a$ and $b$, but not $c$ or any higher power. To obtain an equation related to the conservation of energy, the desired differential equation for $a$ can be integrated.

\[
\frac{d}{dt}(a(t)) = \frac{d}{dt}(a(t))
\]

part (a) independent of $t$, so we can define

\[
\frac{d}{dt} \left( a(t) \right) = \frac{d}{dt} \left( a(t) \right)
\]

Write the differential equation obtained by using the results of part (a). Then observe that in the only time-dependent quantity in your equation, $a(t)$ must be replaced by $a$. Hence if we assume that $a$ is the only constant. The function $a(t)$ then obeys the differential equation

\[
\frac{d}{dt}(a(t)) = \frac{d}{dt}(a(t))
\]

where $\beta$ is a constant. The function $a(t)$ then obeys the differential equation.