

15 минут о математике



$$e^{i(\omega t - \vec{k} \cdot \vec{r})}$$
A diagram illustrating a wave function. A horizontal axis labeled r represents position. A sinusoidal wave is plotted above and below the axis. The wave is represented by a solid line. Vertical arrows indicate the direction of the wave's oscillation. For the negative half-cycle, the arrows point downwards, and for the positive half-cycle, they point upwards. A vertical arrow labeled E points downwards from the horizontal axis, representing the electric field vector. The wave function is labeled $e^{i(\omega t - \vec{k} \cdot \vec{r})}$.

Решение практических задач



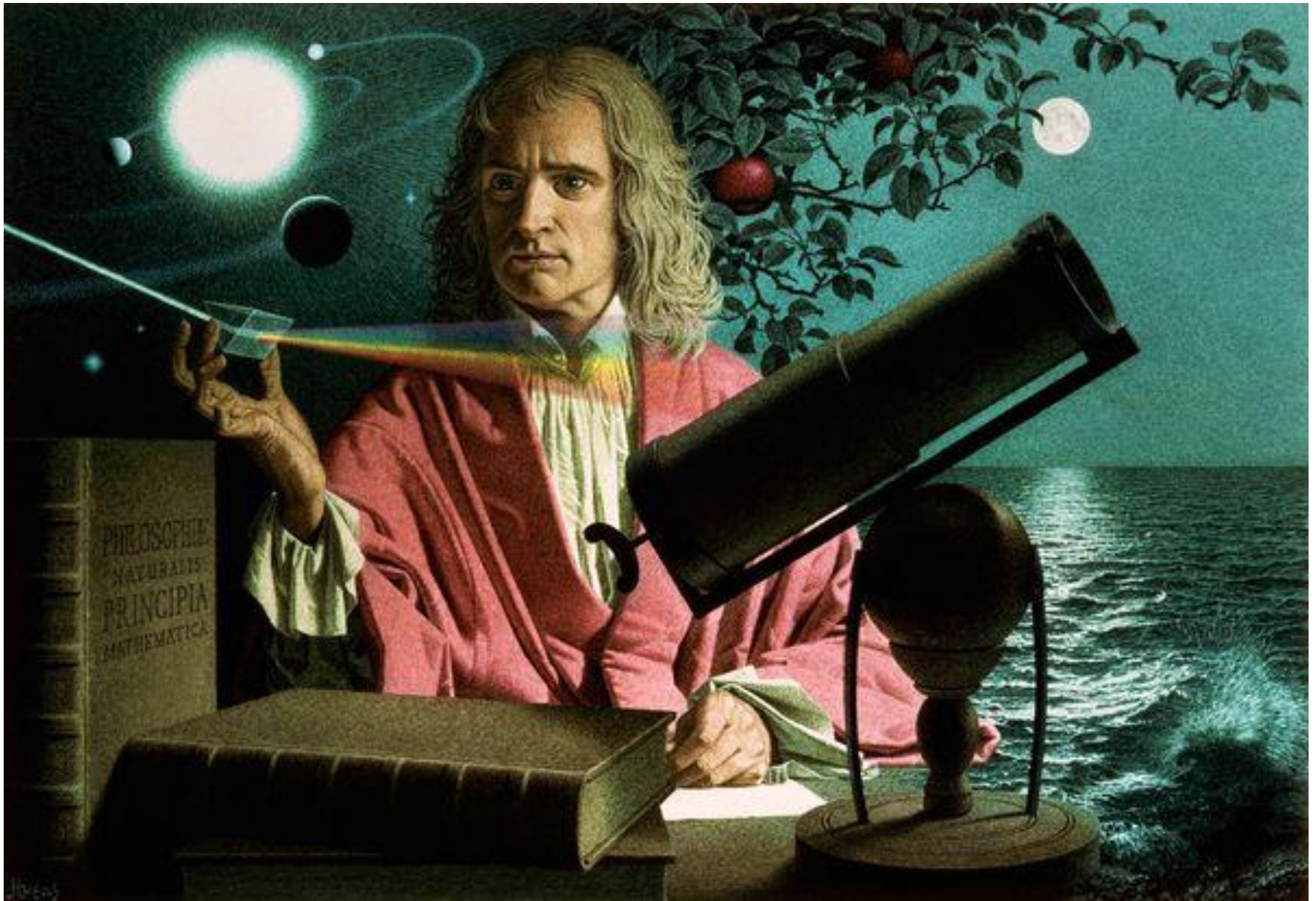
Греческий подход



Движение планет



Научный метод



Электричество



Получившиеся уравнения

$$\oint \vec{E} \cdot d\vec{a} = \frac{Q_{enc}}{\epsilon_0}$$

$$\oint \vec{E} \cdot d\vec{l} = - \int \frac{\partial \vec{B}}{\partial t} \cdot d\vec{a}$$

$$\oint \vec{B} \cdot d\vec{a} = 0$$

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{enc}$$

Система уравнений Максвелла

$$\oint \vec{E} \cdot d\vec{a} = \frac{Q_{enc}}{\epsilon_0}$$

$$\oint \vec{E} \cdot d\vec{l} = - \int \frac{\partial \vec{B}}{\partial t} \cdot d\vec{a}$$

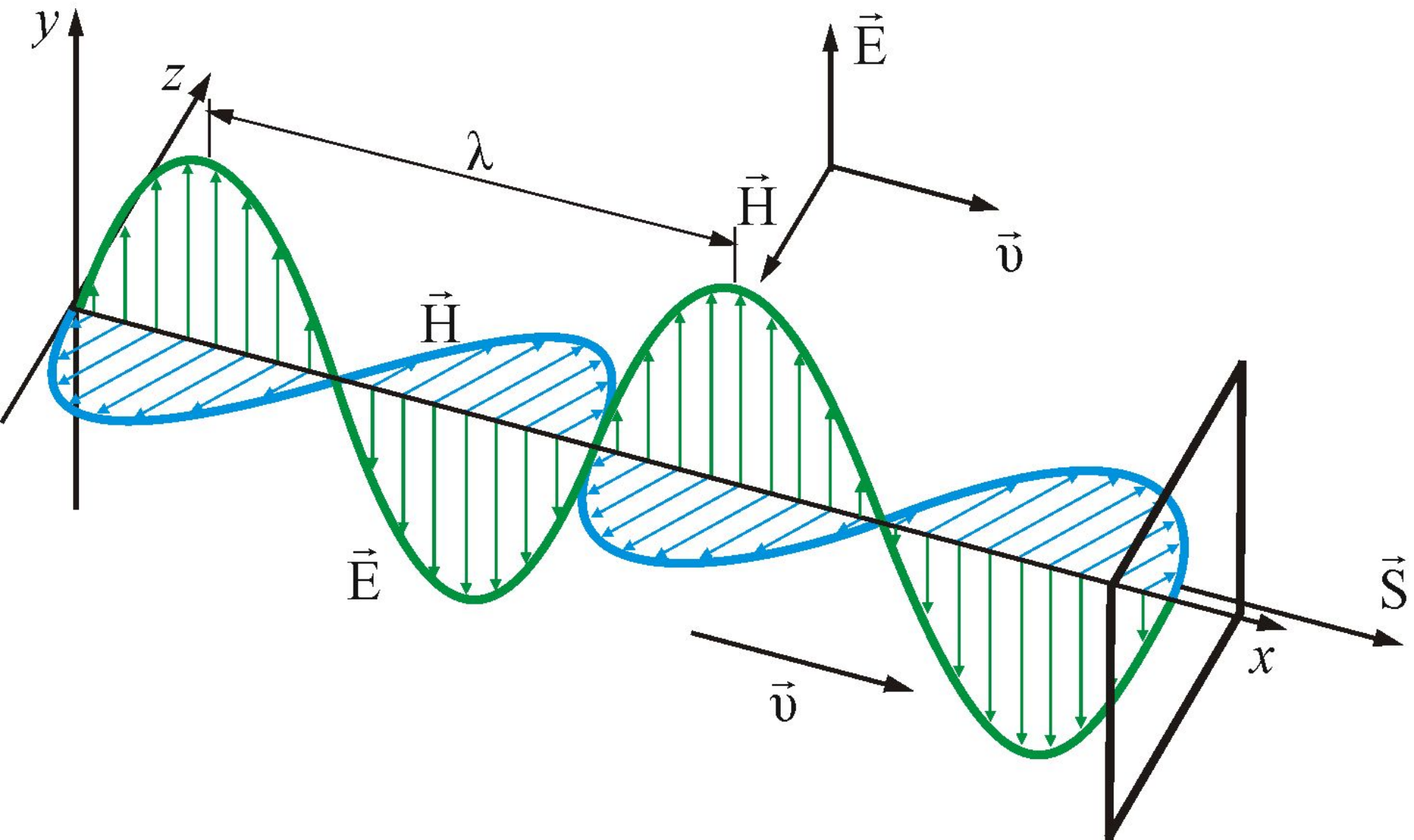
$$\oint \vec{B} \cdot d\vec{a} = 0$$

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{enc} + \mu_0 \epsilon_0 \int \frac{\partial \vec{E}}{\partial t} \cdot d\vec{a}$$

Электромагнитные волны



Математическое моделирование





$$ds^2 = dx_1^2 + dx_2^2 + dx_3^2 - c^2 dt^2$$

if $x_4 = ict$ $ds^2 = dx_1^2 + dx_2^2 + dx_3^2 + dx_4^2$

$$ds^2 = dx_1^2 + dx_2^2 - c^2 dt^2$$

$$ds^2 = 0 = dx_1^2 + dx_2^2 - c^2 dt^2$$

$$dx_1^2 + dx_2^2 = c^2 dt^2$$

$$x_1^2 + x_2^2 = t^2$$

$$ds^2 = 0 = dx_1^2 + dx_2^2 + dx_3^2 - c^2 dt^2$$

$$dx_1^2 + dx_2^2 + dx_3^2 = c^2 dt^2$$

$$d = \sqrt{x_1^2 + x_2^2 + x_3^2} \quad t = d/c$$

$$t' = \gamma(t - vx/c)$$

$$y' = y \quad z' = z$$

$$\left(\begin{matrix} t' \\ r' \end{matrix} \right) = \gamma(v) \left(\begin{matrix} t \\ -v \end{matrix} \right)$$

$$\Delta t' = \gamma(\Delta t - v \Delta x/c)$$

$$\Delta t = \gamma(\Delta t' + v \Delta x'/c)$$

$$\Delta t' = \gamma \Delta t$$

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

$$R_{ab} = R^a{}_b$$

$$R_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

if $G=c=1$

$$R_{\mu\nu} = 8\pi T_{\mu\nu}$$

$$R = 4\pi \frac{8\pi G}{c^4} T$$

$$R_{\mu\nu} = \frac{8\pi G}{c^4} \left(T_{\mu\nu} - \frac{1}{2} T g_{\mu\nu} \right)$$

