

الفيزياء الحديثة في خدمة علم الفلك

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(1727-1643)

-1629) (Huygens)

(Galileo)

(Newton)

Principia

(1695)

.1

$$mv = const$$

v

m

$v \neq 0$

$v = 0$

mv

.2

$$mw = F \quad \frac{d}{dt}(mv) = F$$

.3

$$F_1 = -F_2 \quad \frac{d}{dt}(m_1v_1) = -\frac{d}{dt}(m_2v_2)$$

$$F = f \frac{m_1m_2}{r^2}$$

: f

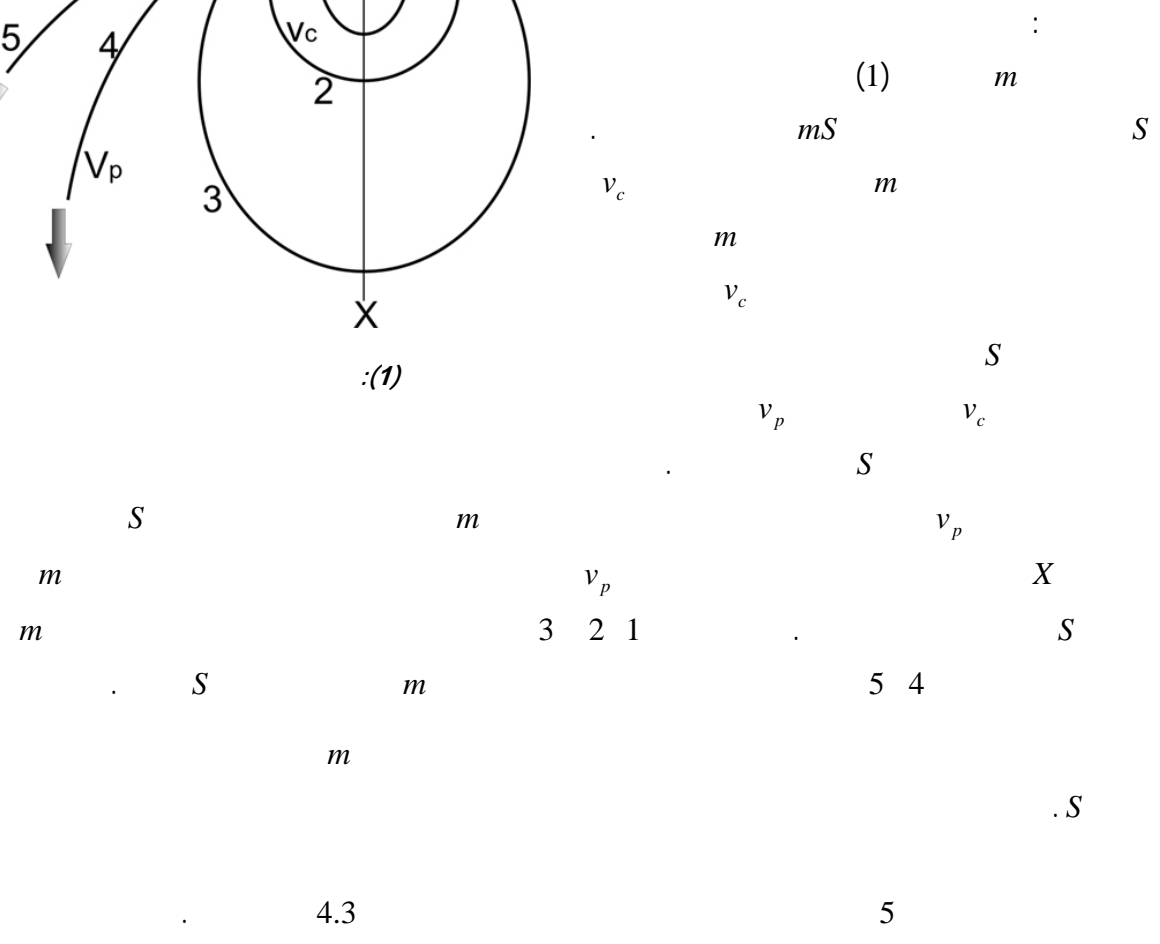
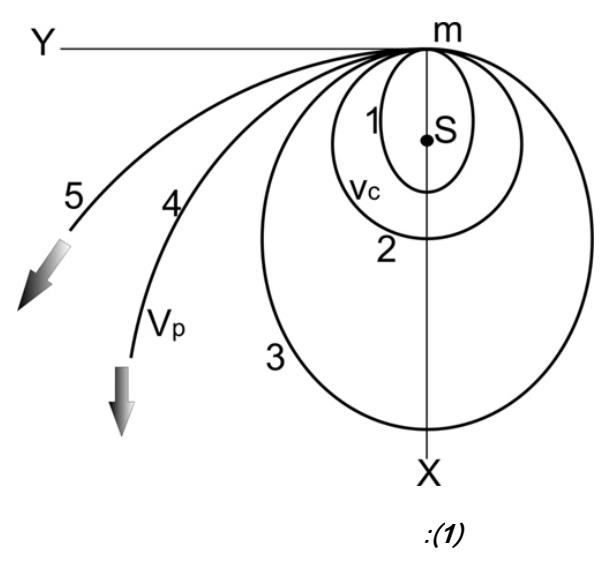
: r

: m_1, m_2

:S

$$f = 6.67 \cdot 10^{-11} \frac{m^3}{kg \cdot s^2}$$

.1
.2



(1822-1738)

(Uranus)

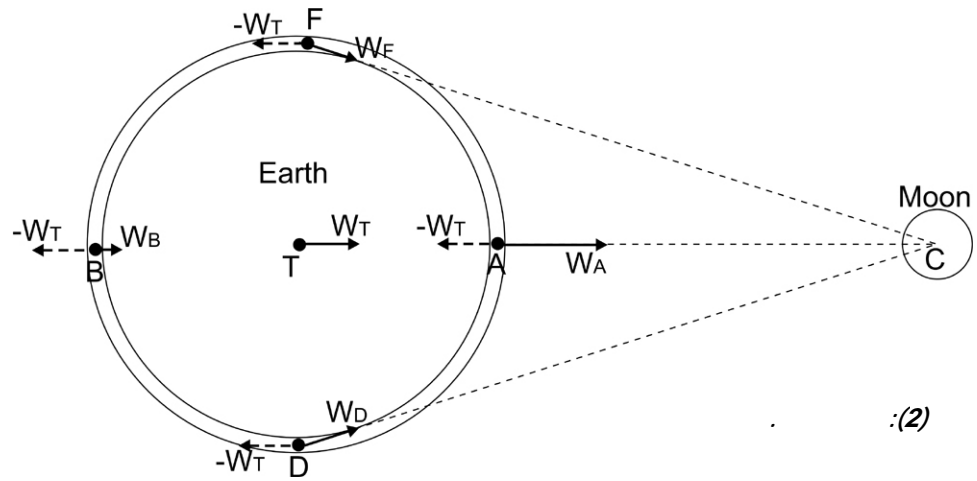
Herschel 1781

Adams Levier 1846

Galley

1930 (Pluto)

(Neptune)



(2)

$$r \quad m : \quad W_T = f \frac{m}{r^2}$$

B W_T A

$$R \quad W_B = f \frac{m}{(r+R)^2} \quad W_A = f \frac{m}{(r-R)^2}$$

: $W_A - W_T$ A ()

$$W_A - W_T = fm \left[\frac{1}{(r-R)^2} - \frac{1}{r^2} \right] = fm \frac{2rR - R^2}{(r-R)^2 r^2}$$

R R^2 R

$$W_A - W_T = fm \frac{2R}{r^3}$$

B

$$W_A > W_T$$

$$W_B < W_T$$

A

F D

2.2

()

Morley Michelson

26

1905

Lorenz

(Einstein)

(3)

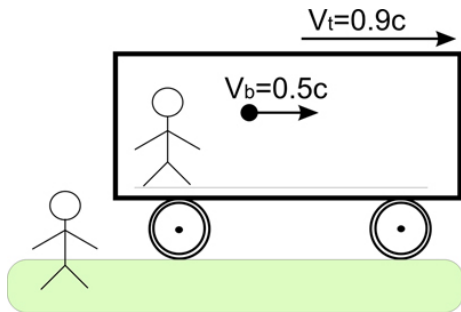
0.9



(1879-1955)

1.4 :

29/28



:(3)

$E = mc^2$:

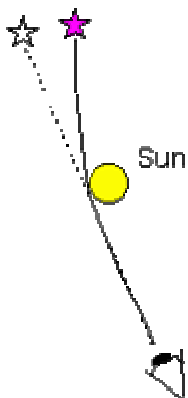
1915

1919

Eddington

.(4)

1.75



:(4)

8

0.6

10

0.6

()

0.6

:

10

1.2

17/15

0.6) 4
4 17/15 .(
! 8 10
(Theory of Everything) (Hocking)