The most used equation going forward (by far)

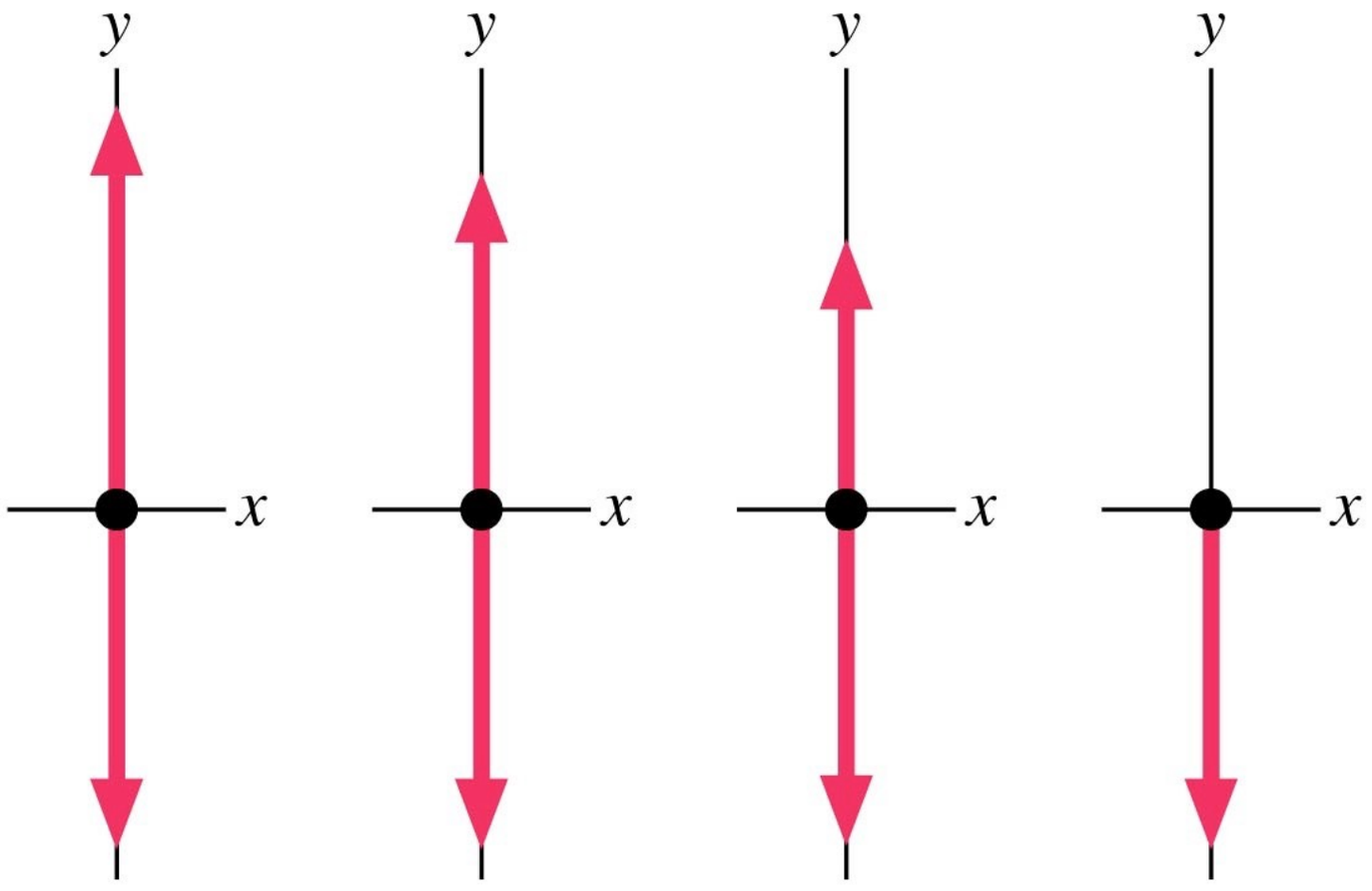
$$\vec{F} = m\vec{a}$$

$$\sum F_x = ma_x \qquad \sum F_y = ma_y$$

$$F_{x1} + F_{x2} + \cdots = ma_x \qquad F_{y1} + F_{y2} + \cdots = ma_y$$

Question #19

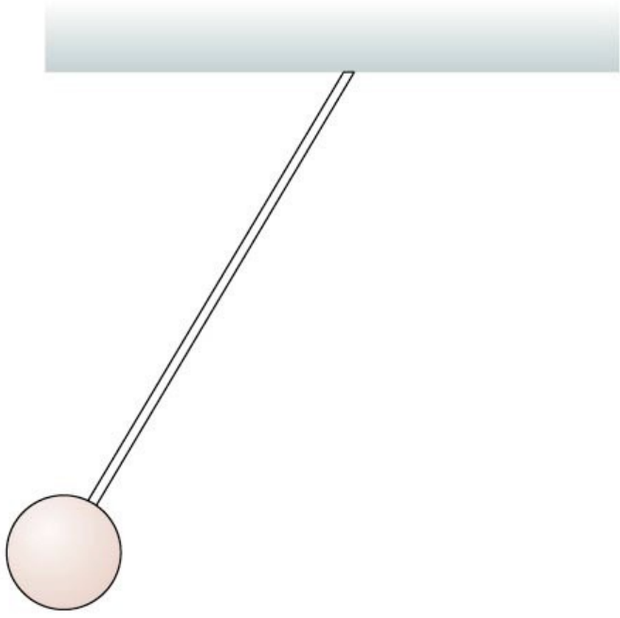
A ball has been tossed straight up. Which is the correct free-body diagram just after the ball has left the hand? Ignore air resistance.

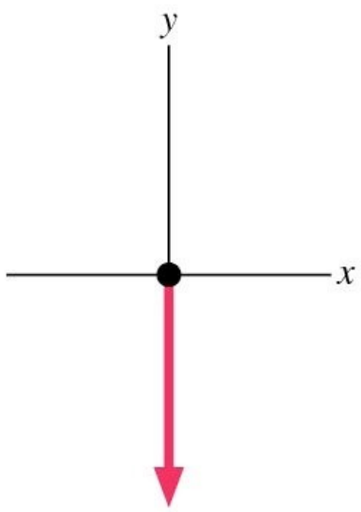


D C B E

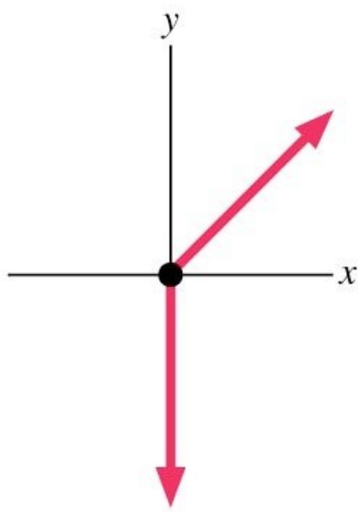
Question #20

A ball, hanging from the ceiling by a string, is pulled back and released. Which is the correct free-body diagram just after its release?

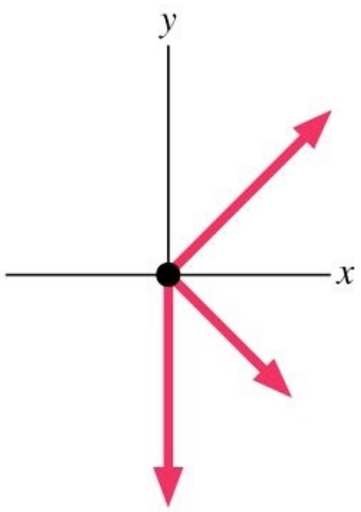




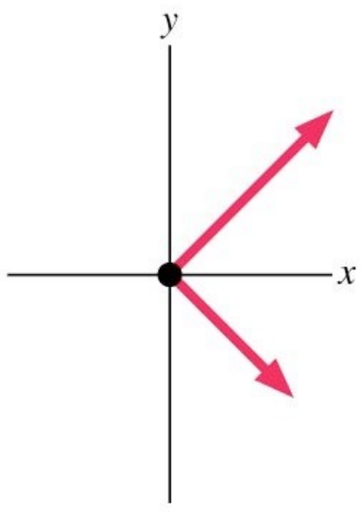
B



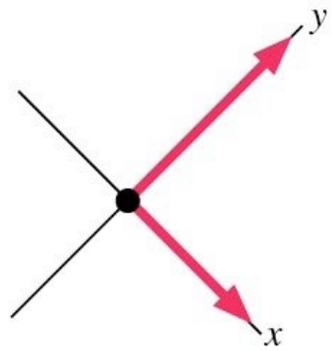
C



D



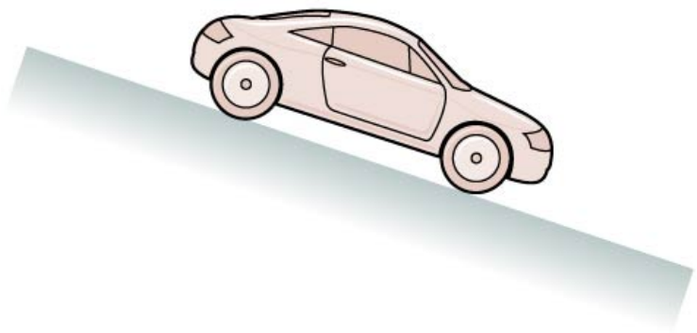
A

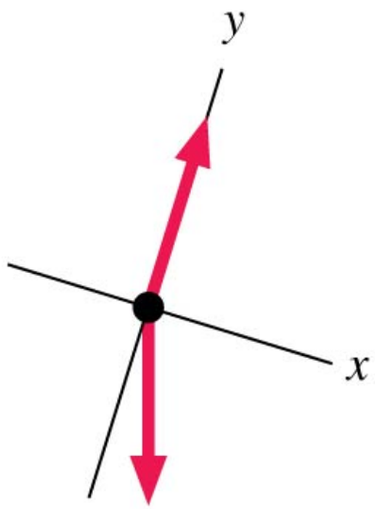


E

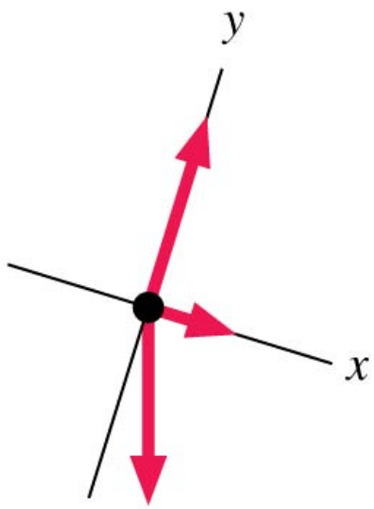
Question #21

A car is parked on a hill.
Which is the correct free-body diagram?





E



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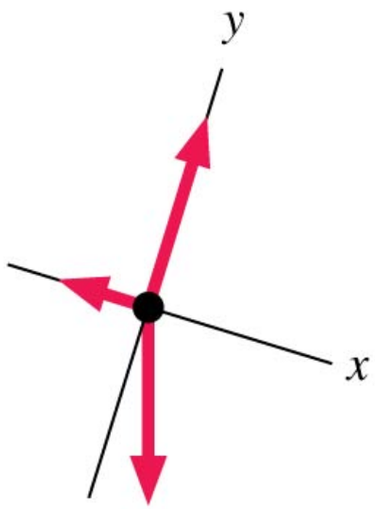
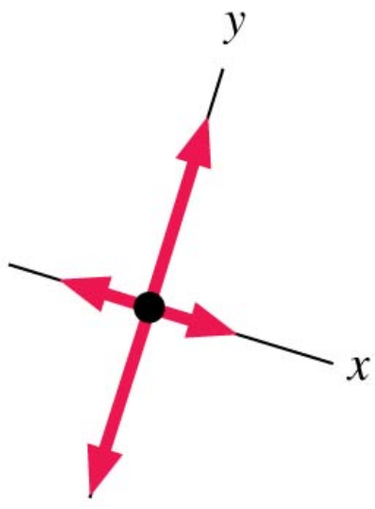
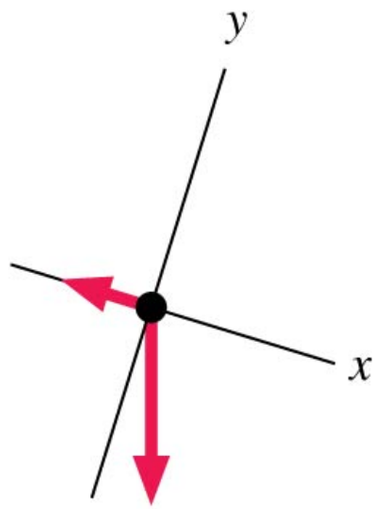


B



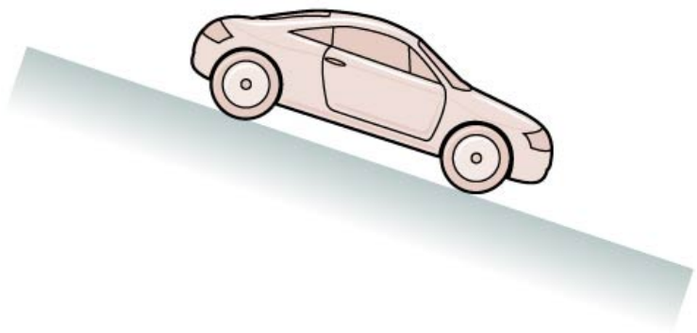
D

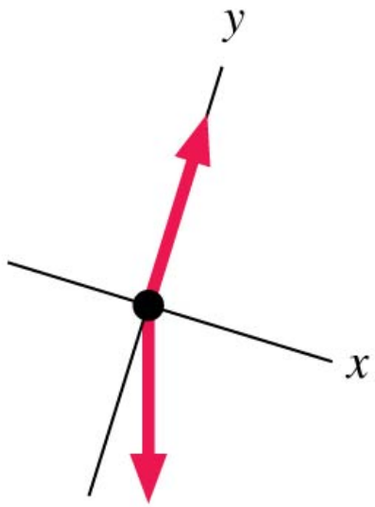


A

Question #21

A car is parked on a hill.
Which is the correct free-body diagram?





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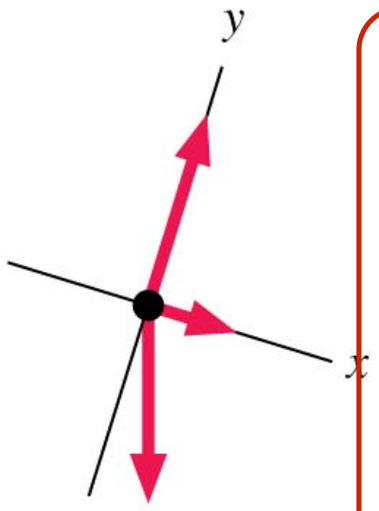
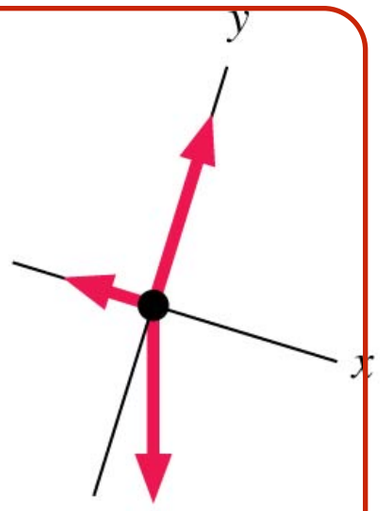
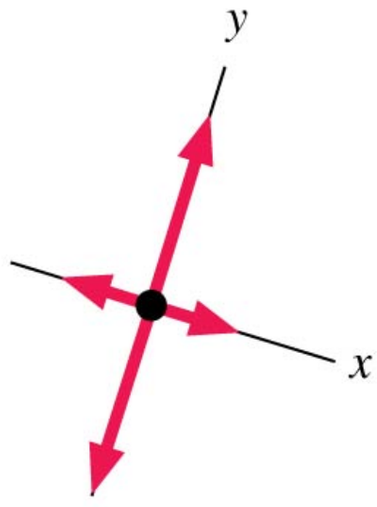


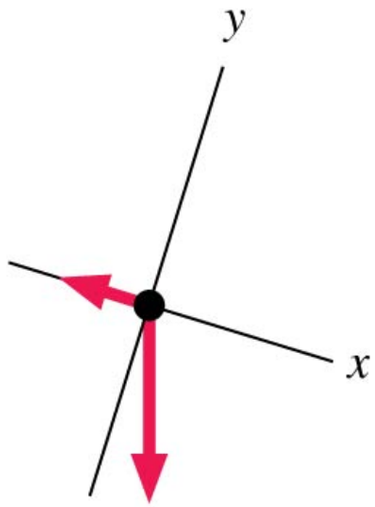
C



B



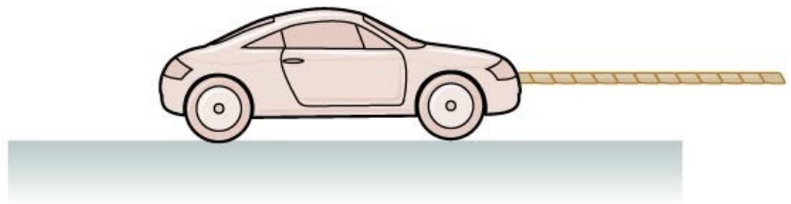
D

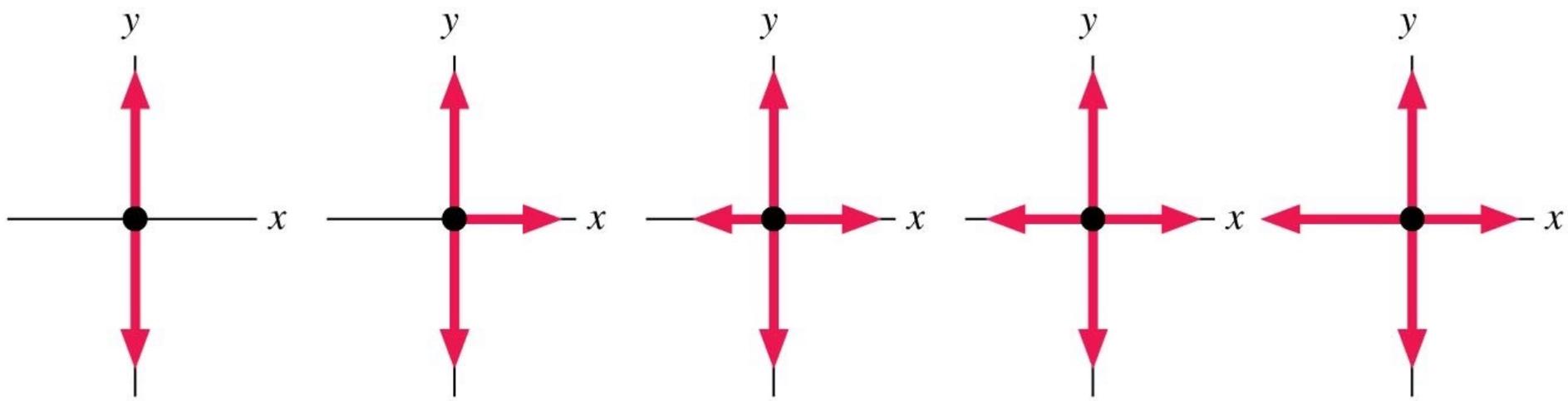


A

Question #22

A car is towed to the right at constant speed. Which is the correct free-body diagram?





E C B D A

Question #22

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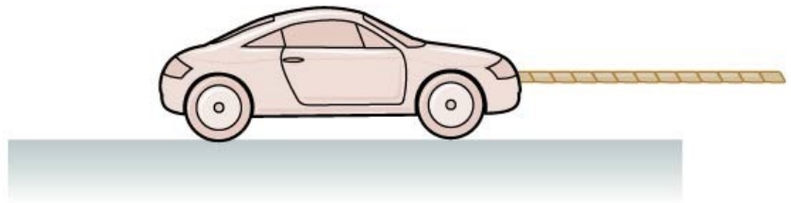
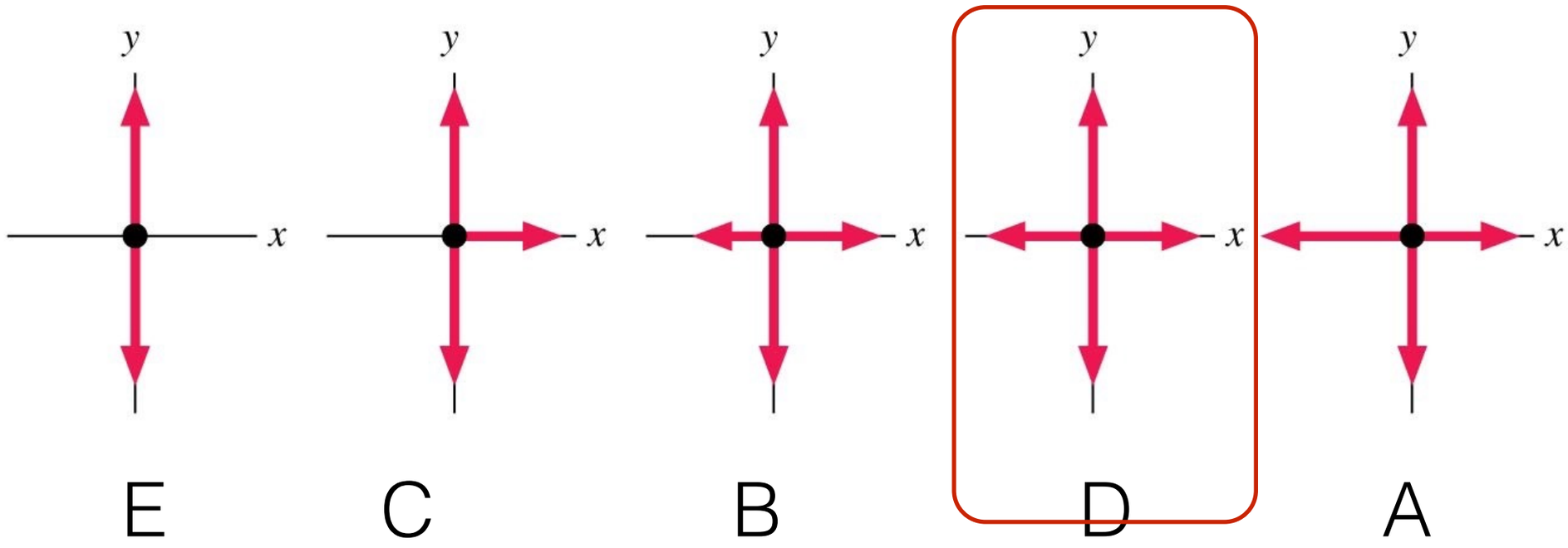
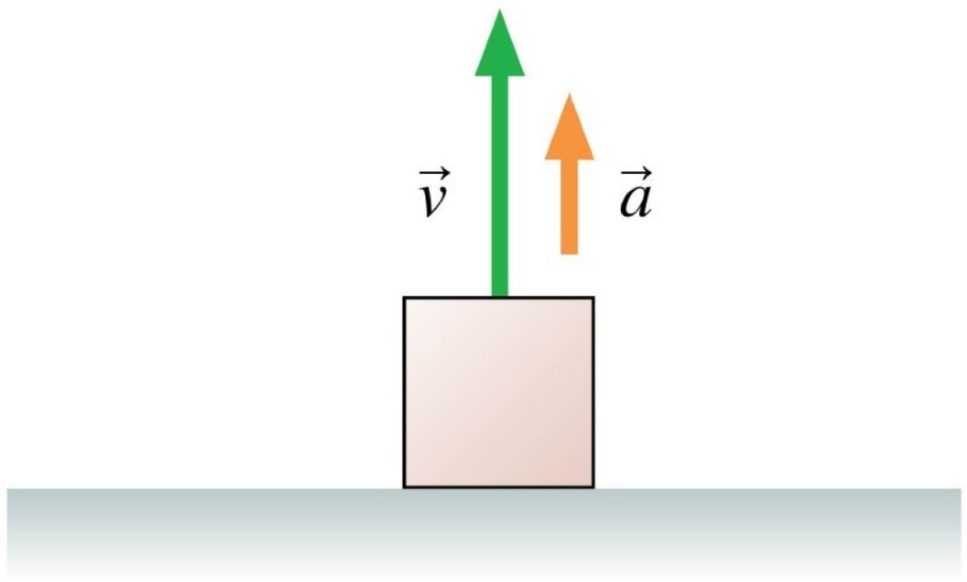




Question #23

The box is sitting on the floor of an elevator. The elevator is accelerating upward. The magnitude of the normal force on the box is



a. $n = 0$.

b. $n = F_g$.

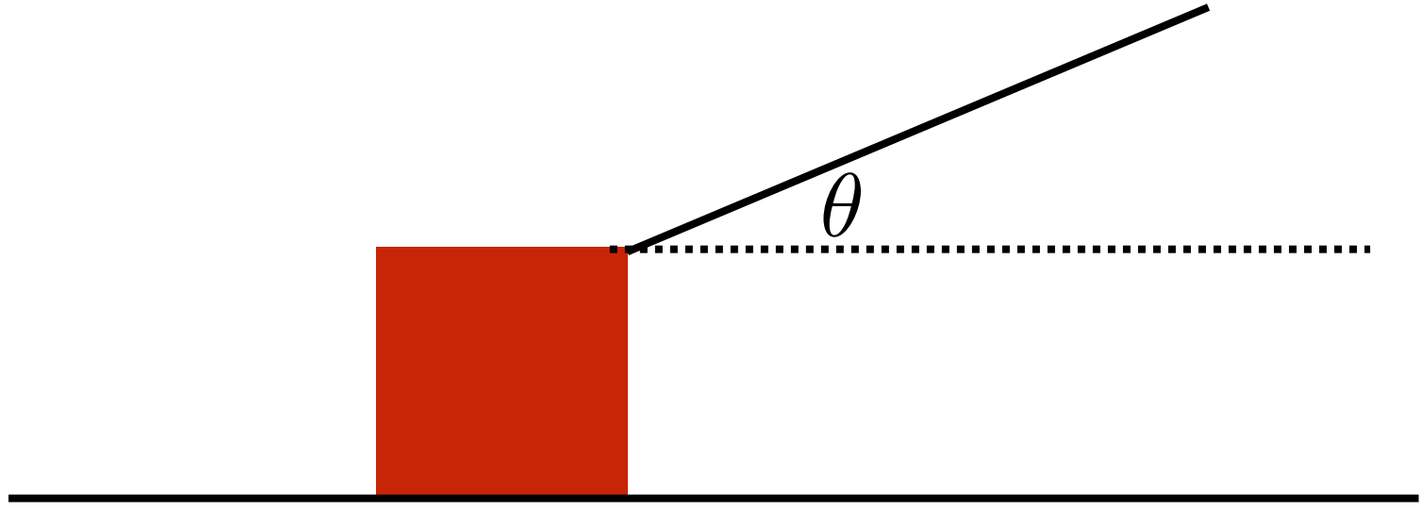
c. $n < F_g$.

d. Not enough information to tell.

e. $n > F_g$.

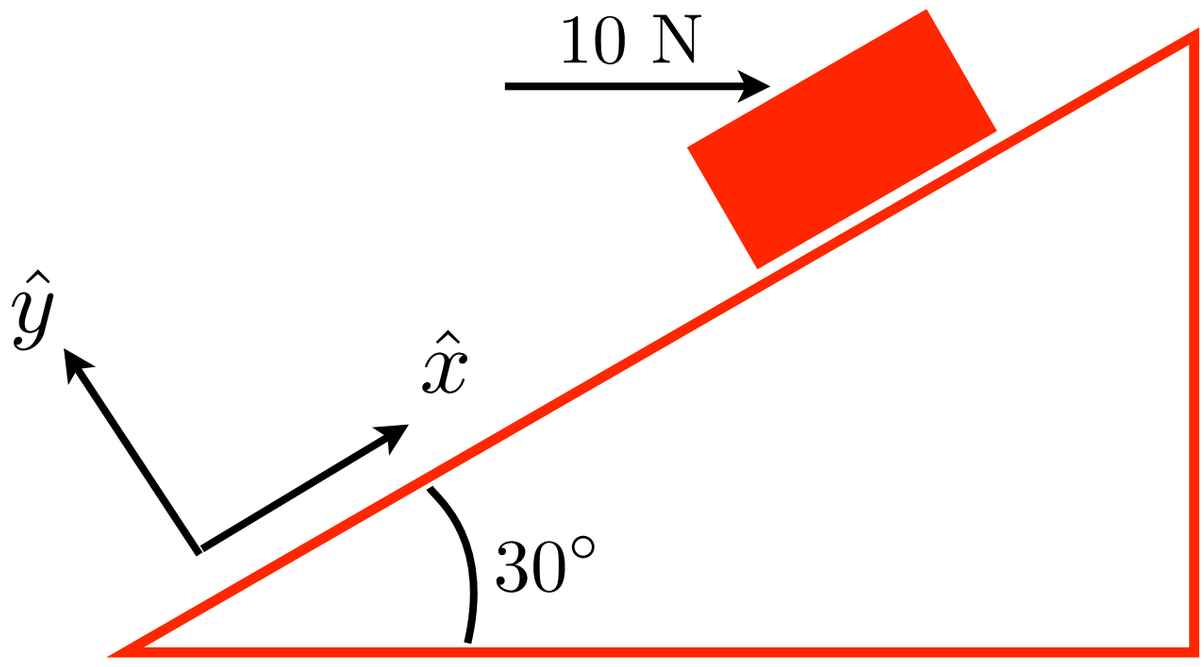
Speed of a towed car

A 10-kg box is pulled across a rough, level surface by a rope attached to the box. The rope is pulling at a 20^o angle above the horizontal with a tension equal to 50 N. The frictional force is equal to 10 N. Starting from rest, how long will it take for this box to travel 10 m?



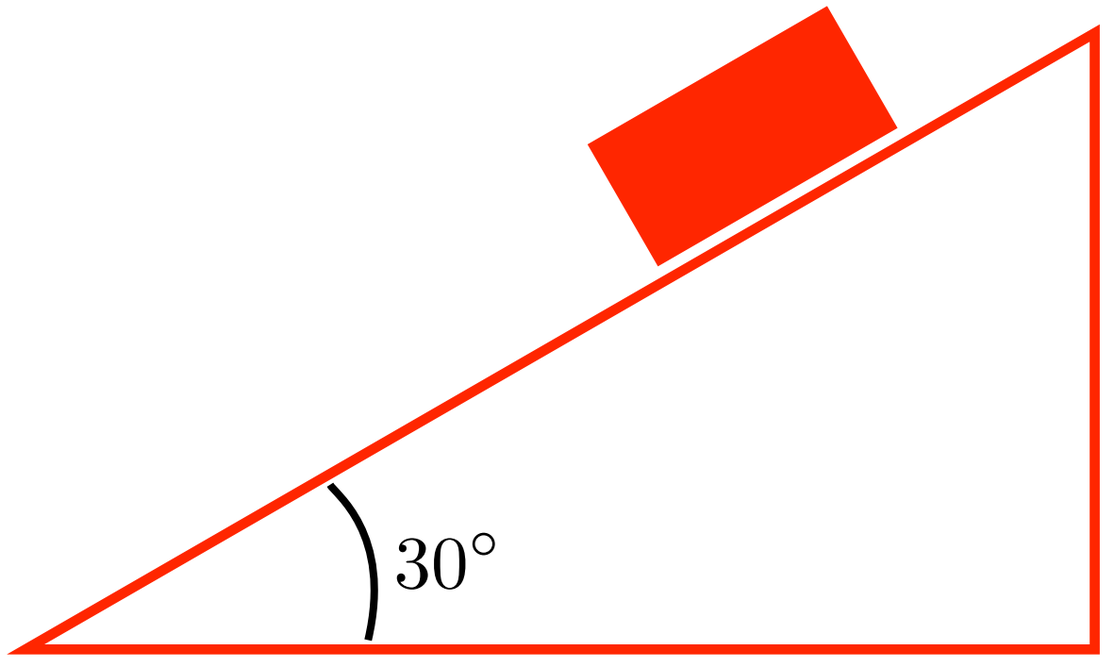
Example

You push <u>horizontally</u> on a 50 N block which is sitting on a 30 degree, incline. What is the direction and magnitude of static friction if the block is to remain stationary?



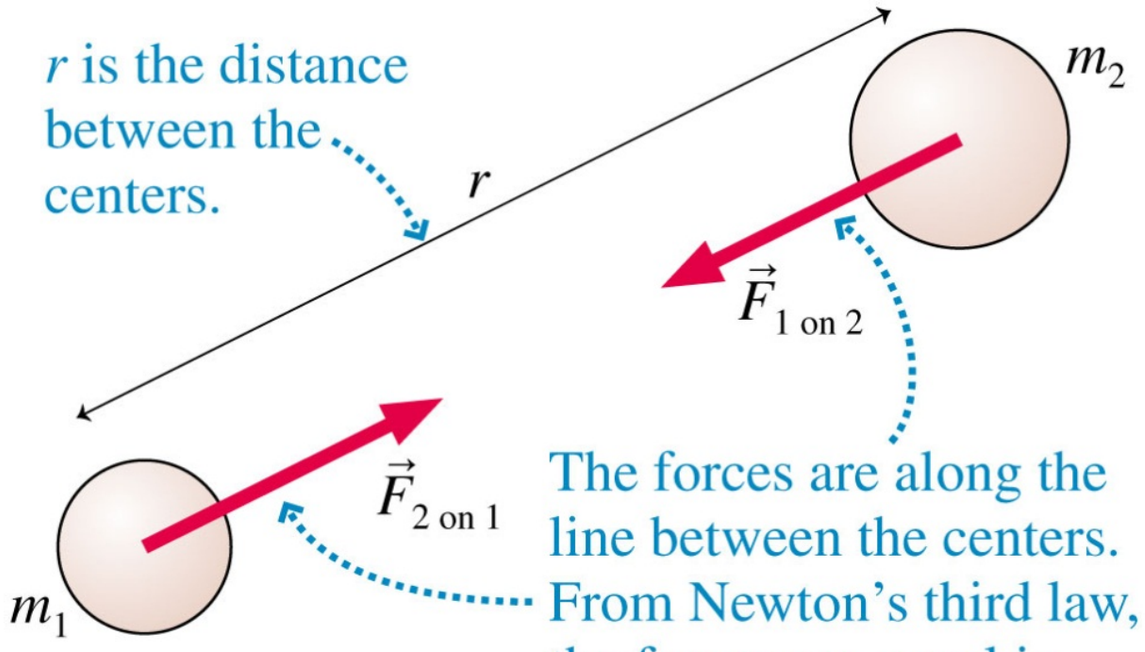
Box on an incline problem.

A 50 N(5 kg) box is placed on a 30 degree incline and has just begun sliding downward. A 5 N kinetic friction force acts on the box. How far down the incline will the box travel in 3.0 s?



Gravity: A Force

Attractive, long-ranged force between any two objects.

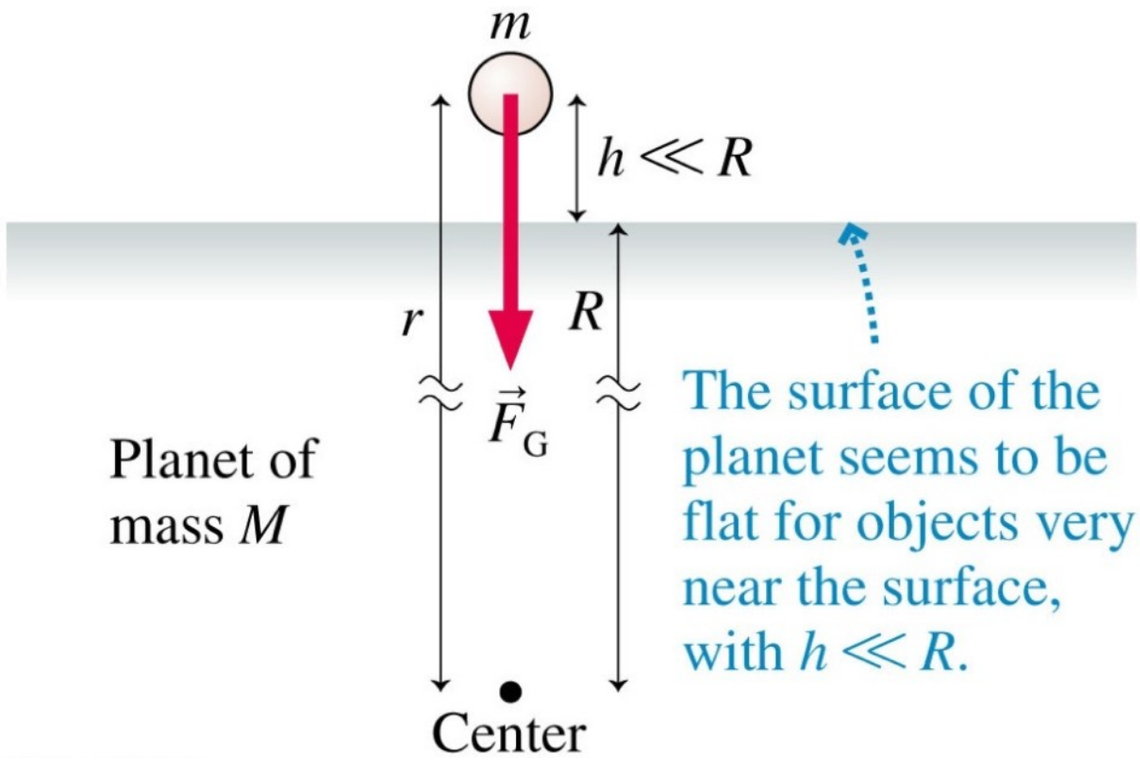


$$F_{1 \text{ on } 2} = F_{2 \text{ on } 1} = \frac{G m_1 m_2}{r^2} \qquad \text{(Newton's law of gravity)}$$

$$G = 6.67 \times 10^{-11} \frac{\text{N m}^2}{\text{kg}^2} \qquad \text{Gravitational constant}$$

Gravity: A force

Will the gravitational force between two people-sized objects be large or small?



$$\vec{F}_G = \vec{F}_{\text{planet on m}} = \left(\frac{GMm}{r^2} \text{ , straight down} \right)$$

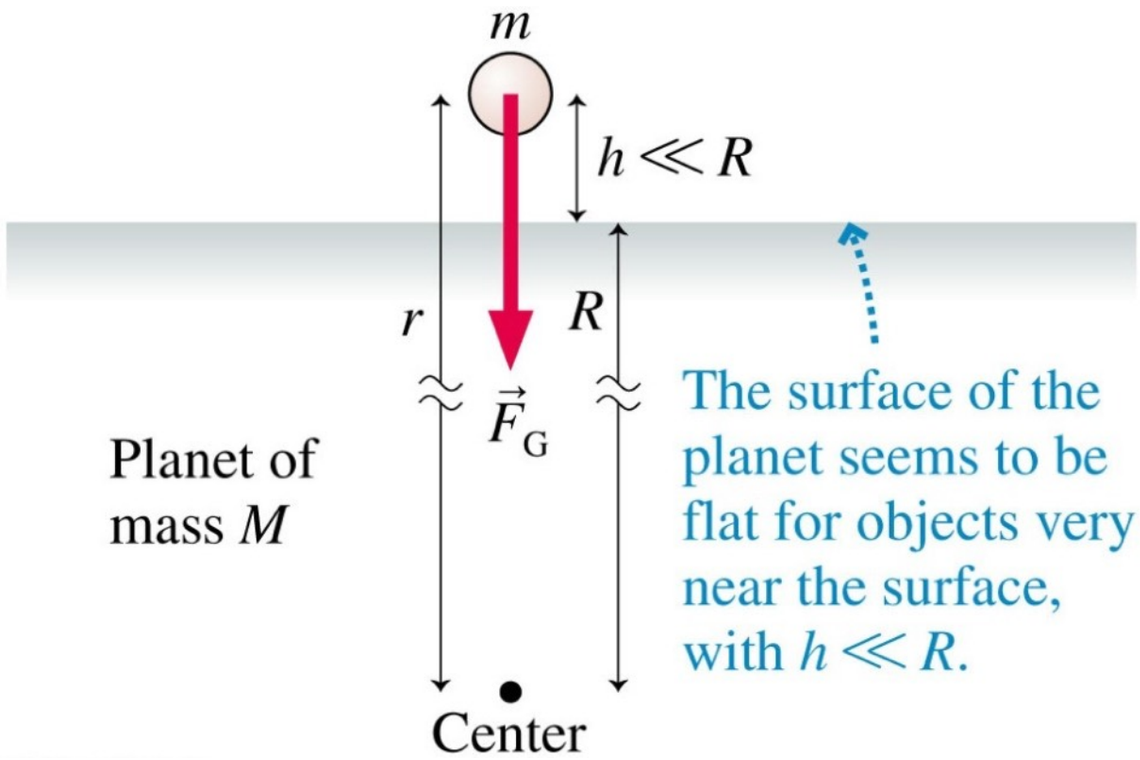
$$G = 6.67 \times 10^{-11} \frac{\text{N m}^2}{\text{kg}^2} \qquad M_E = 5.98 \times 10^{24} \text{ kg}$$

$$R_E = 6.37 \times 10^6 \text{ m}$$

Gravity: A force

Will the gravitational force between two people-sized objects be large or small?

When will the gravitational force be large?



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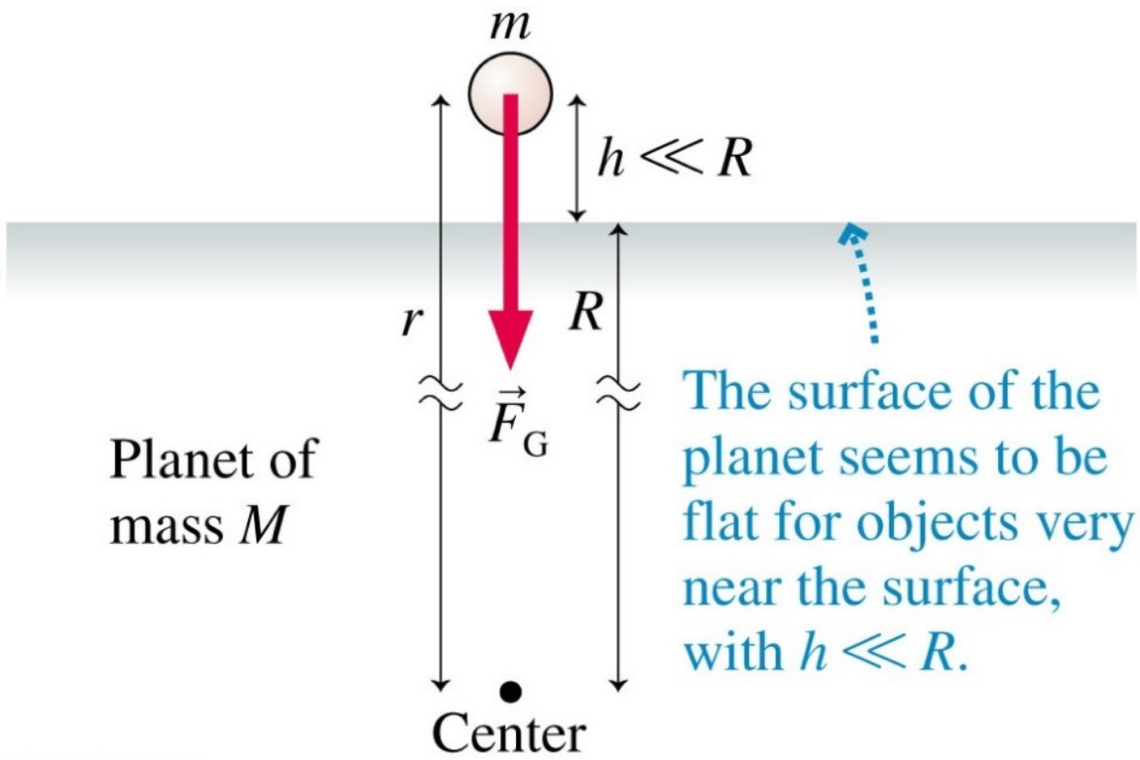

$$\vec{F}_G = \vec{F}_{\text{planet on m}} = \left(\frac{GMm}{r^2} \ , \ \text{straight down} \right) = (mg \ , \ \text{straight down})$$

$$G = 6.67 \times 10^{-11} \frac{\text{N m}^2}{\text{kg}^2} \qquad M_E = 5.98 \times 10^{24} \text{ kg}$$

$$R_E = 6.37 \times 10^6 \text{ m}$$