Answer on Question #40303, Physics, Mechanics | Kinematics | Dynamics

If any weight m is attached to an arm at x distance. This arm is pivoted (can rotate free in vertical plan) in vertical plan. If I want to lift this m weight in circular path up to highest point (Means 0 degrees to 180 degree in vertical plan). How much work is done? Please provide me formula for it.

Solution

According to the law of conservation of energy work done against gravitation is equal difference between final and initial potential energy:

$$W = P_f - P_i.$$

The potential energy can be calculated by the formula

$$P = mgh,$$

where g – acceleration of the gravity.

The height of our object can be defined as

$$h = x \cdot (1 - \cos\theta),$$

where θ – angle between an arm and vertical in an upward direction.

So

$$W = mg(h_f - h_i) = mgx(\cos 0^\circ - \cos 180^\circ) = mgx(1 - (-1)) = 2mgx.$$

Answer: $2mgx$.