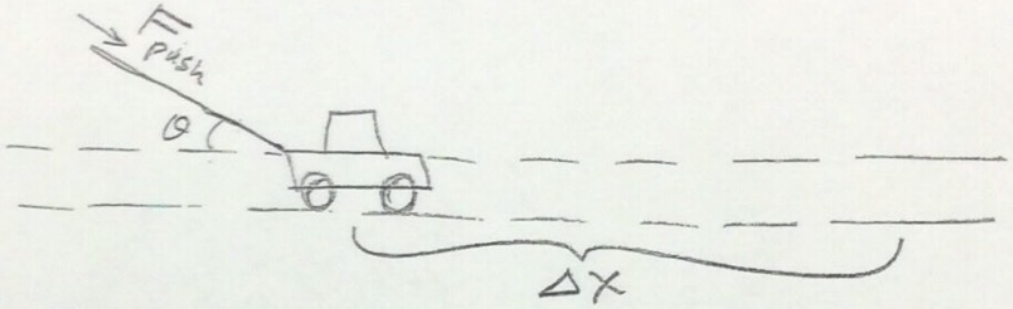
AP Energy

#1

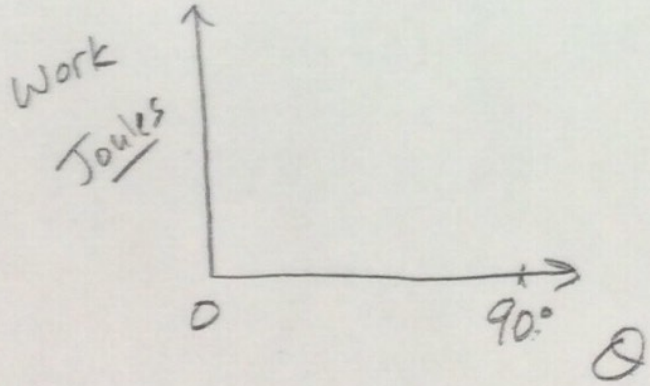
Work = Force · Displacement · cos θ

F_{push} is constant.



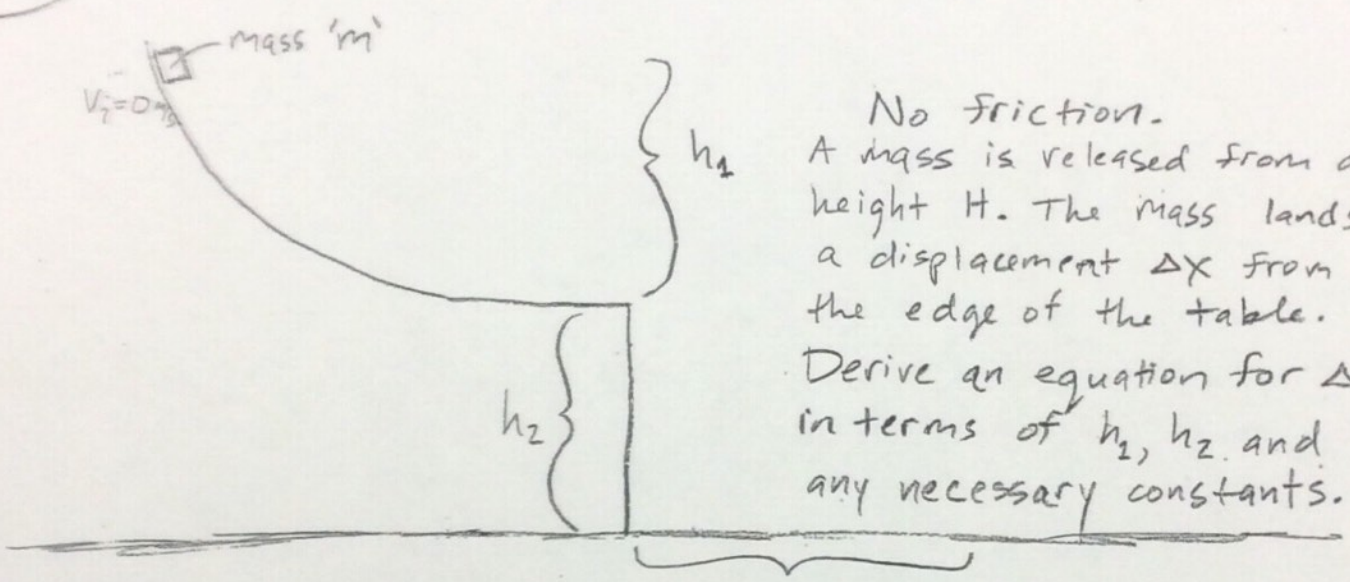
Assume no friction and that the lawn mower travels a fixed displacement of ΔX.

1. Sketch a qualitative graph of work done on the lawn mower as a function of θ when the system travels the fixed displacement ΔX.



2. Explain the reasoning as to why you drew the graph shape. Write complete sentences.

#2



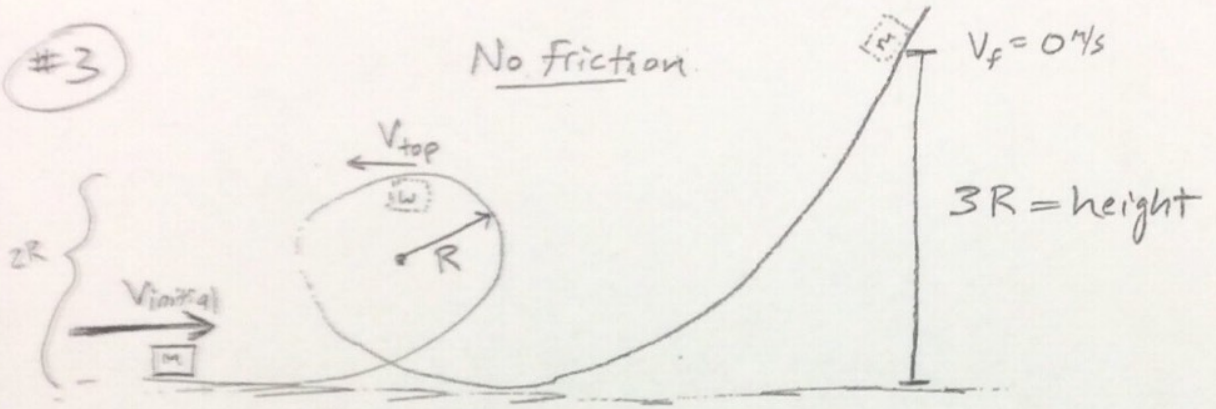
No friction.
A mass is released from a height H. The mass lands a displacement Δx from the edge of the table. Derive an equation for Δx in terms of h_1, h_2 and any necessary constants.

Hint: Use both energy and kinematic equations.

* m and g are not constants, they are variables. A constant could be $\frac{1}{2}$ or '3' for example.

The literal equation should be in simplest form. (aka minimal fractions or radicals and no unnecessarily repeating variables)

#3



A block of mass 'm' has an initial velocity of $V_{initial}$. After completing a loop de loop of radius R it travels to the top of a ramp with height of 3R.

Derive an equation for R in terms of V_{top} and g only.
(do not use $V_{initial}$, m, or height).

Constants and trig identities are acceptable in literal equations

#4

An object from rest drops a distance of d then continues to drop until it reaches a distance of 4d. By what factor did the object's kinetic energy increase from position d to 4d?

* Assume the object is constantly accelerated by gravity.

#5

A ball compressed on a spring with displacement x, is launched straight up in the air and reaches height maximum 'h'. The ball and spring are then angled such that $\frac{1}{3}$ of the spring energy is directed up while $\frac{2}{3}$ is horizontally. By what factor will the new height be as a function of the original h?

#6

A rock is dropped from height h. At height $\frac{1}{2}h$ what fraction of its impact speed has the rock reached?

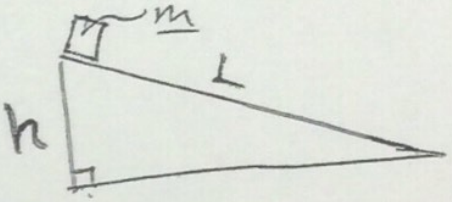
*7

(1) A 500kg satellite is 10^7 meters from the center of the earth in orbit. What is the work done by gravity to keep the satellite in orbit for 1 full revolution around the earth?

(2) If a force is applied perpendicular to the displacement of an object, how much work will be done?

#8 A box of mass m slides down an incline and experiences a friction force F over the length L of the incline with height h. What is the kinetic energy of the box at the bottom?

g = accel. of gravity



The box begins at rest.

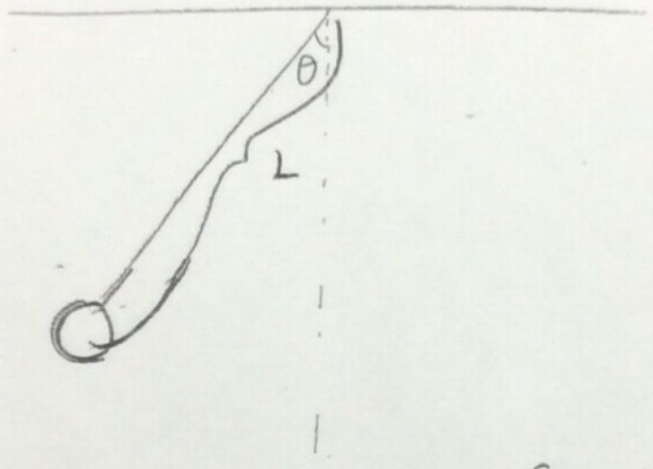
* You cannot use "V" in your answer. only g, h, L, m & F.

#9

A box of mass m slides down a frictionless incline of length L, and height h. What is the work done by gravity? g = Accel. of gravity

Write the literal equation for work in terms of m, h & g.

#10



Write the literal equation for the kinetic energy of the pendulum in terms of L, θ_{max}, m and g at the bottom of the swing. Assume no friction. Mechanical energy is conserved. Mechanical energy includes U_g and K. At θ_{max} the initial velocity of the pendulum is zero.