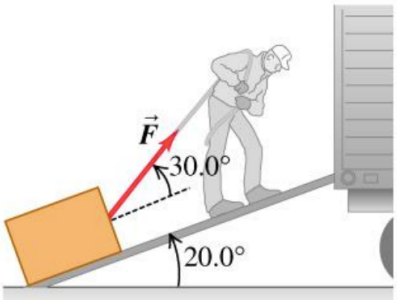
PY211 Spring 2020 Problem Set 3
Due: Friday, 14 February 2020 at 5:00 pm

Student Name_____

Discussion Session _____

Print the homework and work on the problems in the area allocated. You may add additional paper if needed.1. Use enough space to be clear in what you are doing; write comments and explanations in prose; draw helpful diagrams. Staple your pages. Do not hand in a sheaf with loose messy edges torn from a spiral bound notebook. Neatness counts.
Clearly indicate your final answers and make sure your answers include units!

Problem 1. A man is dragging a trunk up the loading ramp of a mover's truck. The ramp has a slope angle of 20.0º and the man pulls upward with a force $\vec{F}$ whose direction makes an angle of 30.0º with the ramp in the figure.



a) How large a force $\vec{F}$ is necessary for the component F_x parallel to the ramp to be 90.0 N?

b) How large will the component F_y perpendicular to the ramp then be?

Problem 2 In outer space, a constant net force of magnitude 141 N is exerted on a 32.0 kg probe initially at rest.

a) What acceleration does this force produce?

b) How far does the probe travel in 5.00 s ?

Problem 3 Draw the free body diagrams for the following scenarios.

a) You walk into an elevator, step onto a scale, and push the "up" button. You recall that your normal weight is 621 N. Draw a free-body diagram for you.

b) Two crates, A and B, sit at rest side by side on a frictionless horizontal surface. The crates have masses m_A and m_B. A horizontal force $\vec{F}$ is applied to crate A and the two crates move off to the right. Draw labeled free-body diagram for crate A.

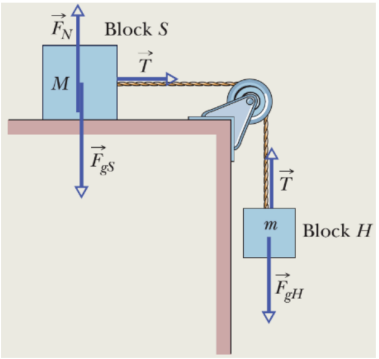
c) For (b) draw labeled free-body diagram for crate B.

Problem 4 A chair of mass 13.5 kg is sitting on the horizontal floor; the floor is not frictionless. You push on the chair with a force F = 45.0 N that is directed at an angle of 41.00 below the horizontal and the chair slides along the floor. Use Newton's laws to calculate the normal force that the floor exerts on the chair.

Problem 5 A 4.80-kg bucket of water is accelerated upward by a cord of negligible mass whose breaking strength is 75.0 N. If the bucket starts from rest, what is the minimum time required to raise the bucket a vertical distance of 12.0 m without breaking the cord?

Problem 6 An object with mass 2 kg is initially at rest. It is acted on by force $\vec{F} = 3\hat{\imath} + 4t^2\hat{\jmath}$. Calculate the velocity of the object as a function of time.

Problem 7 The figure shows a block S (the sliding block) with mass M=3.3 kg. The block is free to move along a horizontal frictionless surface and connected, by a cord that wraps over a frictionless pulley, to a second block H (the hanging block), with mass m=2.1 kg. The cord and pulley have negligible masses compared to the blocks (they are "massless"). The hanging block H falls as the sliding block S accelerates to the right.



a) Find the acceleration of block S.

b) Find the acceleration of block H.

c) Find the tension in the cord.