

CLASS: PHY _____

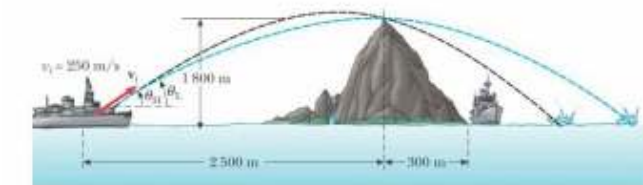
STUDENT #: _____

NAME: _____

Assignment 3: Kinematics and Forces

Assigned: Sept 23 14:30 Due: September 30 19:00

1 An enemy ship is on the east side of a mountain island, as shown. The enemy ship has maneuvered to within 2 500 m of the 1 800-m-high mountain peak and can shoot projectiles with an initial speed of 250 m/s. If the western shoreline is horizontally 300 m from the peak, what are the distances from the western shore at which a ship can be safe from the bombardment of the enemy ship?



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2 An object of mass M is held in place by an applied force \mathbf{F} and a pulley system as shown in Figure P5.55. The pulleys are massless and frictionless. Find (a) the tension in each section of rope, T_1 , T_2 , T_3 , T_4 , and T_5 and (b) the magnitude of \mathbf{F} . *Suggestion:* Draw a free-body diagram for each pulley.



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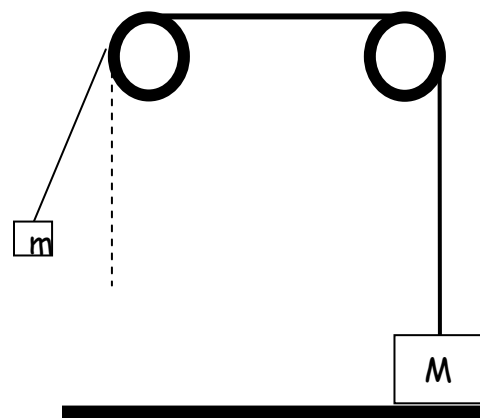
Assignment 3: Forces CONT

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- 3 A 1.00-kg glider on a horizontal air track is pulled by a string at an angle θ . The taut string runs over a pulley and is attached to a hanging object of mass 0.500 kg. (a) Show that the speed v_x of the glider and the speed v_y of the hanging object are related by $v_x = uv_y$, where $u = z(z^2 - h_0^2)^{-1/2}$. (b) The glider is released from rest. Show that at that instant the acceleration a_x of the glider and the acceleration a_y of the hanging object are related by $a_x = ua_y$. (c) Find the tension in the string at the instant the glider is released for $h_0 = 80.0$ cm and $\theta = 30.0^\circ$.



4. The mass $m = 1$ kg is set up as a pendulum as shown on the diagram. Initially in the position of $h = 0.2$ m above the lowest point, and the pendulum is given initial speed of 1 m/s. What is the largest mass M that could be temporarily lifted in such setup?



- 5 A penny of mass 3.10 g rests on a small 20.0-g block supported by a spinning disk. The coefficients of friction between block and disk are 0.750 (static) and 0.640 (kinetic) while those for the penny and block are 0.520 (static) and 0.450 (kinetic). What is the maximum rate of rotation in revolutions per minute that the disk can have, without the block or penny sliding on the disk?

