

X2.7

205

PHYS-205(7) (Kaldon-21297)

Name _____

WMU - Winter 2001

Exam 2 - 100,000 points + 20,000 ☆ points Book Title _____

2/20/2001•Rev.2

State Any Assumptions You Need To Make – Show All Work – Circle Any Final Answers
Use Your Time Wisely – Work on What You Can – Be Sure to Write Down Equations
Feel Free to Ask Any Questions ☆2a ☆2b ☆2c ☆2e

Looking Back Three Years – And One Year to Salt Lake City, Utah, U.S.A. (50,000 points)

1.) American Picabo Street, $m = 57.0 \text{ kg}$, won the Women's Super G ski race at the 1998 Winter Olympics in Nagano, Japan. (a) If the ski run has a vertical drop of 500.0 meters, use Conservation of Energy to find her speed at the finish line, assuming that there were no dissipative forces involved.



(b) Picabo Street's top speed was *not* as high as your answer in (a). If her final speed was 70 m.p.h. (31.3 m/s), find the work done by non-conservative forces (includes friction, air resistance). Note that the fact that the ski course was at an angle, and not a pure vertical drop, is irrelevant to conservation of energy.



Physics 205 / Exam 2

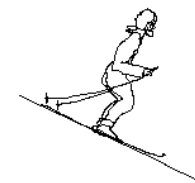
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(c) At 70 m.p.h. (31.3 m/s), Picabo Street enters a compression turn and experiences a centripetal force of 1120 N. Find the radius of this turn.



(d) Picabo Street starts from rest on a hill with $\theta = 41^\circ$. The coefficients of friction for waxed wood on wet snow are 0.14 and 0.10. What is the magnitude of her acceleration?



(e) Picabo has a habit of skiing right on the edge, which usually ends up with either victory or disaster. Suppose she slides off the course at 70 m.p.h. (31.3 m/s) and collides totally inelastically with a race official, $m_2 = 132 \text{ kg}$, who is standing on skis at rest. Right after their collision, what is the speed of Picabo and the official? *They will of course tumble and slide to a halt, but that's a different problem.*



If This is Problem #2, These Must Be Star Problems (50,000 points)

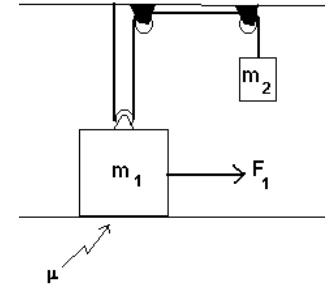
2.) ☆(a) A force $F = \frac{C}{x^3}$ does 1450 J of work going from $x_0 = 1.00 \text{ m}$ to $x = 3.00 \text{ m}$. What is the magnitude of the force at $x_0 = 1.00 \text{ m}$?

☆(b) An object of mass $m = 3.00 \text{ kg}$ begins its motion at $x_0 = 3.00 \text{ m}$, $v_0 = 3.00 \text{ m/s}$, $a_0 = 3.00 \text{ m/s}^2$ and an initial jerk of $j_0 = 3.00 \text{ m/s}^3$. Find the equation for the force, F , acting on this object, where the motion of the object is determined by the following equation:

$$\frac{d^3x}{dt^3} = 3.00 \text{ m/s}^3$$

☆(c) Find the work done when $\vec{F} = 5.00\text{N}\hat{i} + 6.00\text{N}\hat{j}$ and the displacement is 4.26 m @ 130° .

(d) Two masses are connected by ropes and pulleys, and Block 1 is being pulled by a force F_1 as shown, but does not move. Draw the Free Body Diagram for Block 1. *Note that $m_1 \gg m_2$.*



☆(e) An object of mass 6.25 kg has a motion that follows the following equations. Find the vector force \vec{F} at time $t = 1.00 \text{ sec}$.

$$x(t) = 6.00\text{m} + (6.00 \text{ m/s})t + (6.00 \text{ m/s}^5)t^5$$

$$y(t) = 6.00\text{m} + 6.00 \text{ m/s}t + 6.00 \text{ m/s}^2 t^2$$