| Wed, October 10, 2018 | **Physics 210: UnTest #2: page 1** | **Name** _____ |
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Instructions: You have a total of 50 minutes to complete this test.
Answer each question completely showing complete details.
For complete credit you must include correct SI units with numerical answers.
Time Start_____ Time finish _____pledged _____

Constants: $g=9.8\frac{m}{s^2}$

**[1]** A mass m is placed on a spring of spring constant k and the spring is compressed through a distance x . The spring is then released. After the mass leaves the spring, it slides along a flat surface with a coefficient of friction μ (assume that it only encounters friction after leaving the spring).

**(a)** in the box shown, draw and correctly label an appropriate free body diagram for the sliding mass (after leaving the spring)

**(b)** With what speed will the mass leave the spring in terms of m, k and x?

**(c)** suppose that instead of sliding on a flat surface, the mass rose up an inclined place of angle θ (you may now assume that this system is frictionless). How high above the initial level will the mass rise in terms of k, x and m?

**(d)** provide numerical solutions with correct SI units for the case k=10 N/m, m=2 kg , and x=.5 m and μ=0.5.

**d:b**_____ **d:c** _____

**[2]** Mass $m_1$ traveling at a velocity v collides and sticks to a mass $m_2$. which is initially at rest. The pair then slide across a flat surface which is frictionless.

**(a)** What is the velocity of the pair right after the collision in terms of $m_1$, $m_2$ , and v?

**(b)** The mass pair then encounters a spring of spring constant k. How much does the spring compress until the mass pair stops in terms of $m_1$, $m_2$, k and v?

**(c)** If the original collision were completely elastic and $m_2$ was 1/2 $m_1$ , with what velocity would $m_2$ move after the collision in terms of v only?

**(d)** provide numerical solutions with correct SI units for the case $m_1$ =1 kg, $m_2$ =0.5 kg, μ=0.6, v=2 m/s and k=5 N/m.

**d:a** _____ **d:b** _____ **d:c** _____

**[3]** A mass m is attached to a string of radius R and swung in a planar circle and thus travels through a distance of 2πR in each revolution. It is observed that the time it takes for the mass to go around the circle is T. You may assume this undergoes uniform circular motion.

**(a)** what is the tangential velocity, v, of the mass in terms of R and T?

**(b)** What is the angular velocity, ω, of the mass in terms of R and T?

**(c)** What is the centripetal acceleration of the mass in terms of R and T?

**(d)** What is the centripetal force acting on the mass in terms of m, R and T?

**(e)** For the case m=2 kg, R=1 m, and T=1 s, provide numerical answers with correct SI units.

**e: a**_____ **e:b** _____ **e:c**_____ **e:d** _____

**[4]** A point on a wheel of radius R starts from rest and begins to rotate with an angular acceleration α.

**(a)** What is the tangential acceleration of the point at a later time t in terms of α and R?

**(b)** What is the angular velocity of the point at a later time t?

**(c)** At some later time t, through what angle has the wheel turned?

**(d)** At some later time t, what is the centripetal acceleration of the point?

**(e)** Provide numerical solutions with correct SI units for the case R=1 m, α=2 “rad”/$s^2$ and t=4 s.

**e:a _____ e:b _____ e:c_____ e:d _____**