Physics 112 Course Review #3 Intro to Forces/Friction

1. Define inertia. Give an example for an object being in motion and at rest.

Inertia is the tendancy of an object to stay @ rest or to continue moving unless acted on by an external force
ex motion- if there is no friction a moving object will continue moving forever
rest - unless hit with enough force an object @ rest will not move

2. Calculate the force of gravity on a 47 kg object located on the Earth, Moon, and Mars. (461 N, 77 N, and 175 N)

$m = 47kg$

Earth $F_g = mg$
$= (47)(-9.81 m/s^2)$
$= 461 N$

Moon $F_g = mg$
$= (47)(1.64)$
$= 77N$

Mars $F_g = mg$
$= (47)(3.7$
$= 175N$

3. Summarize what physical process causes the force of friction.

Friction is caused by the molecules of one object rubbing across another object. The electrons move from place to place creating and breaking bonds continuously.

4. Suppose a box requires 100 N of force to begin to move. You start by applying 50 N of force and slowly increase that force until the box moves at a constant velocity. ($F_{net}=0$)

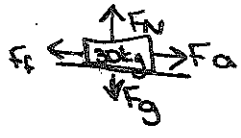
   a. Describe the forces of friction that are involved.

The forces of friction involved are static friction and kinetic friction. Static friction acts on the box keeping it at rest until the force is great enough to get it in motion. Once it is in motion kinetic friction acts on the box causing it to stop moving eventually

   b. Would the minimum force necessary to keep the box moving at a constant velocity be less than, equal to, or greater than 100 N? Provide a brief explanation to your answer.

The force necessary to keep the box moving @ a constant velocity is less than the 100N required to make it move
kinetic friction < static friction

5. A 30 kg box is moved with a net force of 17 N. The applied force necessary is 105 N.



$m = 30kg$, $F_{net} = 17N$, $F_a = 105N$, $F_f = ?$

   a. What is the force of friction? (-88 N)

$F_{net} = F_a + F_f$
$17 = 105 + F_f$
$17 - 105 = F_f$
$-88N = F_f$

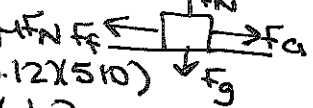
   b. What is the normal force? (294 N)

$|F_N| = |F_g|$
$F_g = mg$
$F_g = (30)(9.81)$
$F_g = 294$
$\therefore F_N = 294N$

   c. What is the coefficient of kinetic friction? (0.30)

$F_f = \mu F_N$
$\frac{-88}{294} = \frac{\mu 294}{294}$
$\mu = 0.30$

6. A 52 kg object is being pulled with an applied force of 217 N. The coefficient of kinetic friction is 0.12. Calculate the net force acting on the object? (156 N)



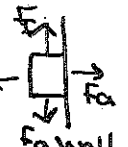
$m = 52kg$, $F_a = 217N$, $\mu_k = 0.12$, $F_{net} = ?$

① $F_N = mg$
$= (52)(9.81)$
$= 510N$

② $F_f = \mu F_N$
$F_f = (0.12)(510)$
$F_f = -61.2$

③ $F_{net} = \Sigma$ Forces
$F_{net} = F_a + F_f$
(need to find F_f 1st)
$F_{net} = 217 + -61.2$
$F_{net} = 156N$

7. A 65 kg person is pressed up against the wall using an applied force of 1500 N. For the person not to fall, calculate the minimum coefficient of static friction necessary between the wall and the person. (0.43)



$m = 65kg$, $F_a = 1500N$, $\mu_s = ?$

$|F_a| = |F_N| \therefore F_N = 1500N$
$|F_g| = |F_f|$

need to find F_f 1st

① $F_g = mg$
$= (65)(9.81)$
$F_f = 638N$

② $F_f = \mu F_N$
$\frac{638}{1500} = \frac{\mu 1500}{1500}$