Forces Practice

Section 1: F_g

1)   Calculate the force of gravity on a 25 kg mass at the surface of the earth.
2)   A 75 kg mass is on the surface of Mars when an astronaut lifts it with a sping scale. The scale has a reading of 259 N. What is the gravitational field strength on Mars?
3)   How much force must a horizontal surface exert to hold up a 2.0 kg book and what is the name of that force?

Section 2: F_{net}

1)   A cat is dragged at a constant velocity of 3.0 m/s across sandpaper. What is the total force on the cat?
2)   A 1200 kg car is pushed by three students from rest to 5.0 m/s, 30 m along a level surface. What was the unbalanced force used on the car?
3)   Assuming the force of friction on the car in problem 2 was 100 N how much combined force did the students have to exert?
4)   What is the acceleration of a 5.0 kg mass when pulled with 10 N [E] and 12 N [N]?
5)   What is the net force of a mass when pulled with a force of 10 N at 30° S of W and 12 N at 40° W of N.

Section 3: F_f and F_n (level surfaces)

1)   A 10 kg mass is pulled along a level surface using a force of 25 N. What is the coefficient of friction?
2)   A force of 7.5 N is used to pull a rubber friction block across a table at constant speed. If the coefficient of friction is 0.35 what is the mass of the block?
3)   What shape is a graph of Ff vs. Fn and what is the slope?

Section 4: F_e

1)   Calculate the extension of a spring whose spring constant is 20 N/m when a 0.50 kg mass is hung on it.
2)   What is the spring constant of a desk if a force of 784 N compresses it from height 1.00 m to 0.92 m?

Section 5: Forces on ramps

1)   What is the normal force and force down the ramp on a 5.0 kg mass resting on a 40° slope?
2)   What is the acceleration of a 3.0 kg mass on a 30° frictionless slope?
3)   What is the normal force on the mass in #2 above?
4)   What is the force of friction on the mass in #3 above if m = 0.2?
5)   What would be the acceleration of the mass in #4 above given m = 0.2?**

** tough question!

Answers:
1)   245 N   1) 0 N   1)0.26
1) 0.245 m   1) Fn = 37.5N Fdown = 31.5 N

2)   3.45 m/s²   2) 500 N   2) 2.19 kg
2) 9800 N/m   2) 4.9 m/s²

3)   19.6 N, Fn   3) 600 N   3) linear, m
3) 25.5 N

4) 3.12 m/s² at 50° NofE   4) 5.09 N
5) 16.9 N at 14° NofW   5) 3.20 m/s²