Physics 30S Dynamics Assignment

1. A 10kg steel ball is dropped from a height of 2.0m above the ground.
   a. What is the net force acting on the steel ball (Ignore air resistance)
   b. What is the acceleration of the steel ball
   c. What is the net force on the earth
   d. What is the acceleration of the earth (m = 5.98×10^{24} kg)

2. If a 200N force from the north and a 500N force from the east are acting on a 30kg object, find
   a. The net force (include direction)
   b. The acceleration (include direction)

3. While pushing with 150N, the acceleration of a 20kg desk is 5.0m/s^2. Find the force of friction opposing the motion.

4. Johan isn't strong enough to hold his backpack. While pulling up, his 12kg backpack is still accelerating at a rate of 1.5m/s^2 down. What is the apparent weight of his backpack?

5. Astronauts when taking off can experience accelerations of up to 25m/s^2. If The Astronauts' hand and glove together have a mass of 2.0kg, what force must the astronaut exert in order to lift his hand above his head with a constant speed relative to him. (Apparent weight question)

6. A construction crane uses a cable with a maximum strength of 300 000N. If a 5000kg object is on the crane, what is the
   a. Maximum acceleration the crane can lift the object with.
   b. The minimum distance the crane can stop the object from falling if it is falling at 7m/s

7. The safety mechanism on a crane requires that if a falling load reaches a velocity of 10m/s, the crane must be able to stop the load in 0.5 seconds. If the load is 4000kg, find the minimum strength the cable needs to be.

8. An 80kg man is standing in an elevator, and suddenly the cable snaps.
   a. What _apparent_ weight does the man have?
   b. When the safety clamps engage, they stop the elevator from an initial velocity of 12m/s in 2.0 seconds. What _apparent_ weight does the man now have?

9. A fighter jet landing on an aircraft carrier has a 55m runway. If the jet has an initial velocity of 70m/s, find the net force on the jet if it has a mass of 9000kg.