Problem Set #4 Newton's Laws
Due Friday September 28th

Name:_____

I worked with:

Equations:

Displacement:	$x(t) = x_0 + v_0t + ½ at^2$
Velocity:	$v(t) = v_0 + at$
Final Velocity (time):	$v_f = v_0 + at_f$
Final Velocity (displacement):	$v_f^2 = v_0^2 + 2ax_f$
Force:	$F = ma$
Acceleration due to gravity:	$9.8\ m/s^2$

1. Draw Free Body Diagrams for the Following:
    a. A book on a table that is at rest
    b. A plane flying straight at a constant speed
    c. A pie hitting someone in the face
    d. A car speeding up
    e. An object of your choice in a situation of your choice

2. A passenger sitting in the rear of a bus claims that he was injured when the driver slammed on the brakes, causing a suitcase to come flying toward the passenger from the front of the bus. If you were the judge on the case, what would your response be? Draw a diagram AND explain your response.

3. Long ago, it was thought that space travel was impossible, because space was effectively a vacuum with nothing to push against. How can you explain the fact that rockets work and that space travel is possible, using one of Newton's Laws?

4. A 10-kg box is pushed horizontally from rest across a frictionless surface for 5 seconds by a Force (F_A) of 20-N.
    a. Draw a free-body diagram of the box **and** determine its acceleration **and** final velocity.
    b. Draw a position vs time, velocity versus time, and an acceleration vs. time graph for this scenario.

5. A 2 Kg box is put on the surface of an inclined plane at 27 ° with the horizontal. The surface of the inclined plane is assumed to be frictionless.
    a. Draw a free body diagram of the box on the inclined plane and label all forces acting on the box.
    b. Determine the acceleration a of the box down the plane.
    c. Determine the magnitude of the force exerted by the inclined plane on the box.