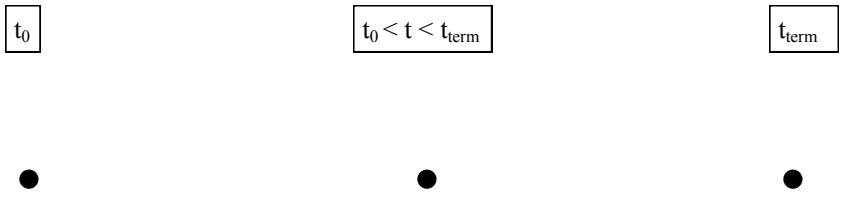
KC's Quantitative Problems
Free Body Diagram

1) You drop a cat off a very tall building. The force of air drag on the cat increases as the cat's speed increases. Draw a FBD for (a) the point the cat is released, (b) a short time later, and (c) a long time later when the cat has reach terminal velocity.

2) A real object dropped from a very high height is not always in free-fall due to air resistance. At the instant the object is released it accelerates with magnitude **g**, but this instantaneously decreases as the object gains speed. The faster the object falls the greater the resistive force from the air becomes. At a certain speed, called terminal velocity, the object is in equilibrium. Draw a free-body diagram (FBD) for the object, for three different times of its motion; right after it is released ($\mathbf{t_0}$), a time (**t**) between t_0 and terminal velocity, and once it's reached terminal velocity ($\mathbf{t_{term}}$). Properly label each force in the FBDs.



3) When objects fall through the atmosphere they acquire a force in the opposite direction of their motion from the air molecules they displace. This is often called the drag force and the magnitude of the force increases with increased speed. Eventually the object falling reaches a great enough velocity that the object is in equilibrium. This equilibrium velocity is called terminal velocity. Consider an object released from rest, falling towards earth. Draw a FBD for the following times in the object's fall: 1) just as the object is released from rest, 2) When the object's acceleration has decreased by a factor of 2 from the initial moment of release, 3) When the object has reached terminal velocity, 4) long after the object has reached terminal velocity but before it hits the ground.