Newtonian Mechanics

MATH 211 - 01

1. A 50 kg mass is shot from a cannon straight up with an initial velocity of 10m/sec off a bridge that is 100 meters above the ground. If air resistance is given by $5v$, determine the velocity of the mass when it hits the ground.

2. A 960 lb object is given an initial upward velocity of 60 ft/sec near the surface of Earth. The atmosphere resists the motion with a force of 3 lb for each ft/sec of speed. Assuming that the only other force acting on the object is constant gravity, find its velocity v as a function of t and find its terminal velocity.

3. An object in free fall experiences an air resistance with a force proportional to the velocity. If the initial velocity is 0 feet persecond and proportionality constant is 0.01, write and solve a differential equation that would result in the function describing the velocity at any given time. Determine the terminal velocity of the object in freefall, if one exists.

4. A 10 kg mass is given an initial velocity of $v_0 \leq 0$ near Earth's surface. The only forces acting on it are gravity and atmospheric resistance proportional to the square of the speed. Assuming that the resistance is 8N if the speed is 2m/sec, find the velocity of the object as a function of t and find the terminal velocity.