Problem 1:
Use the Euler Tangent Line Method to evaluate \( y(1.2) \) when \( y' = t^2 + y^2 \) with initial value \( y(1) = 3 \) and \( h = .1 \).

Solution:
I: pt is \((1, 3)\) and slope \( m = y' = t^2 + y^2 = 1 + 9 = 10 \)
Equation of the tangent line is \( y - 3 = 10(t - 1) \) which simplifies to \( y = 10t - 7 \)
Now evaluate \( t = 1.1 \) to get \( y(1.1) = 4 \)

II: Iterate again using point \((1.1, 4)\) and slope \( m = y' = t^2 + y^2 = (1.1)^2 + 16 = 17.21 \)
Equation of the tangent line is \( y - 4 = 17.21(t - 1.1) \) which simplifies to \( y = 17.21t - 14.931 \)
Now evaluate \( t = 1.2 \) to get \( y(1.2) = 5.721 \)

Problem 2:
A ball with mass of .30 kg is thrown upward with initial velocity of 15 meters/sec from the roof of a building 50 meters high. Resistance is given to be .020 times velocity. Find the equation for velocity at any time \( t \) and the limiting speed.

Solution:
\[
mg' = -mg - kv
\]
\[
.3v' = -3(9.8) - .02v
\]
\[
v' = -9.8 - .0666v
\]
\[
v' + .0666v = 9.8 \quad \text{using integrating factor } u(t) = e^{0.0666t}
\]
\[
\int [ve^{0.0666t}]' \, dt = \int -9.8e^{0.0666t} \, dt
\]
\[
ve^{0.0666t} = -\frac{9.8}{0.0666} e^{0.0666t} + C
\]
\[
v = -147.147 + Ce^{-0.0666t}
\]
Using the initial velocity \( v(0) = 15 \)
\[
15 = -147.147 + Ce^0
\]
\[
C = 162.147 \text{ and so the equation for velocity is } v = -147.147 + 162.147e^{-0.0666t}
\]
\[
\text{Limit } v = -147.147 \text{ m/sec}
\]
Problem 3: (There was a typo in problem statement.)

A body of mass 10 slugs is dropped from a height of 1000 ft with no initial velocity. The air resistance constant is k. The limiting velocity is -320 ft/sec. Find the equation for velocity at any time t. When will Speed equal 160 ft/sec?

Solution: Use the equation below.

\[ mv' = -mg - kv \]

\[ 10v' = -10(32) - kv \]

\[ v' = -32 - (k/10)v \]

\[ v' + (k/10)v = -32 \text{ use } u(t) = e^{\frac{k}{10}t} \]

\[ \int \left( ve^{\frac{k}{10}t} \right) dt = \int -32e^{\frac{k}{10}t} dt \]

\[ ve^{\frac{k}{10}t} = \frac{-320}{k} e^{\frac{k}{10}t} + C \text{ and } v = \frac{-320}{k} + Ce^{-\frac{k}{10}t} \]

use initial value \( v(0) = 0 \) to get \( C = \frac{320}{k} \)

Since \( \lim_{t \to \infty} v = \lim_{t \to \infty} \frac{-320}{k} + \frac{320}{k}e^{-\frac{k}{10}t} = -320 \text{ ft/sec} \)

so \( k = 1 \) and \( v = -320 + 320e^{-\frac{t}{10}} \)

Now set \( v = -160 \) and solve for \( t \).