Skydiver Problem Homework

Assume there is air resistance, up is positive, down is negative, and that g = -10 m/s/s.

Force air resistance is proportional to the square of velocity, but we will ignore this fact for simplicity.

1. A skydiver is falling at a terminal constant velocity of - 50 m/s. The skydiver's mass is 80 kg.
   a. Draw a force diagram for the skydiver.

   b. Write the $\sum F$ in terms of $F_{Air\ Resistance}$ and F_g.

   c. Calculate force gravity in Newtons. $F_g = mg$

   d. Calculate the $F_{Air\ Resistance}$ using Newton's 2nd Law $\sum F = ma$. Use substitution.

2. The skydiver opens her parachute and begins to experience a constant positive acceleration of +8 m/s/s as the chute opens. Assume force air resistance on the skydiver (not including the parachute) is the same as in problem #1.
   a. Draw a force diagram for the skydiver as the parachute opens.

   b. Write the $\sum F$ in terms of $F_{Air\ Resistance}$, $F_{tension}$ and F_g.

   c. Calculate force gravity in Newtons. $F_g = mg$

   d. Calculate the $F_{tension}$ using Newton's 2nd Law $\sum F = ma$. Use substitution.

   e. How many seconds until the skydiver comes to reach - 34 m/s?

3. The skydiver's parachute strings snap when she reaches a velocity of -34 m/s and she begins to accelerate downward at -4 m/s/s. The skydiver's new mass without the parachute is 75 kg and force air resistance is much less now that she is traveling at a slower speed.
   a. Draw a force diagram for the skydiver.

   b. Write the $\sum F$ in terms of $F_{Air\ Resistance}$ and F_g.

   c. Calculate F_g in Newtons. $F_g = mg$

   d. Calculate the new $F_{Air\ Resistance}$ using Newton's 2nd Law $\sum F = ma$.

   e. How much time is required for her to reach a final velocity of - 50 m/s?

   f. Calculate the distance fallen as she accelerates from -34 m/s to -50 m/s.