1. Text: 2.3.2

2. Text: 2.3.9 (This one is short!)

3. Text: 2.3.10

4. A more realistic model of air resistance assumes that the force due to air resistance is proportional to the square of the velocity. As a consequence, if the speed of the object doubles, the force due to air resistance goes up by a factor of 4. The differential equation is

$$mv' = -mg - kv|v|.$$

The term $-kv|v|$ is the force due to air resistance; the absolute value signs are needed to ensure that the force due to air resistance always points in the opposite direction to v

a) This equation is autonomous. Determine all equilibria (and their stability). Also, sketch some time series.

b) Convert this equation to a dimensionless equation assuming that $v > 0$ (i.e. for an ascending object).

c) Solve the dimensionless equation.

d) Convert the solution back into dimension-full variables.