Answers (but not solutions) are on the web.

1. Consider the IVP $\dfrac{dy}{dt} = y^2 - t - 1$, $y(1) = 2$. Use Euler's method with $\Delta t = .1$ to find the points (t_1, y_1) and (t_2, y_2) and write down the formula for y_{n+1} in general.

2. Consider the DE $y' = Ky^2 - y^3$ where $K > 1$.
   (a) Sketch the phase phase line and identify the equilibrium solutions.
   (b) Sketch the solutions to the DE satisfying $y(0) = -1$, $y(0) = 1$ and $y(0) = K + 1$.
   (c) Describe the possible values of $\lim_{t\to\infty} y(t)$.

3. A parachutist whose mass is 50 kg drops from a helicopter and falls toward the ground under the influence of gravity. Assume the force due to air resistence is proportional to the velocity of the parachutist, with proportionality constant $b = 20N - s/m$ when the chute is closed. The chute does not open until the velocity of the parachutist reaches 20 m/s.
   (a) Does the chute open, and if so, when? (You may assume that the helicopter is at a high enough altitude.)
   (b) If the mass of the parachutist is 40kg, does the chute open and if so, when?

4. Consider the DE: $t^2y'' + (t - 1)y' + (t - 2)y = 0$. What is the largest interval around the initial conditions $y(1) = 1$, $y'(1) = 3$ on which the solution is certain to exist?

5. Find the interval on which the IVP $x(x - 4)y'' + 3xy' + 2y = x^2$, $y(1) = 2$, $y'(1) = 3$ has a unique solution. Do not solve it!

6. Show that the two functions are linearly independent solutions of the DE and find the linear combination that satisfies the given initial conditions: $y_1(t) = e^t$, $y_2(t) = t^2 + 2t + 2$, $ty'' - (t + 2)y' + 2y = 0$, $y(1) = 4$, $y'(1) = 6$.

7. Find the general solutions to the following DEs:
   (a) $y'' - 7y' + 12y = 0$,
   (b) $x^2y'' + 3xy' = 2$,
   (c) $y^3y'' = 1$,