Polking Text Assignments Chapters 1 and 2

For graphs generated put a title on the graph using your name.

Section 1.1 2-4, 6, 8, 9

Section 1.2 7, 8, 10, 11, 13-15

Section 1.3 1, 4, 7, 9-10, 15-16, 25-26
(for #1, 4, 7 use MATLAB code like
C =[-1:1:3]; t=[-pi:.01:pi]; y=sin(t) - t.*cos(t); figure, for jj=1:length(C), yy=y+C(jj); plot(t, yy), hold on, end, hold off ➔ Change the values for C, the values for t, and the equation of the function.)
(for #9 and 10 just find the general solution)
(for 15 and 16 use MATLAB to graph the solution of the IVP)

Section 2.1 1, 2, 3, 6, 7, 10, 21, 24, 25, 26, 35
(for #1-2 solve for y' in the expression φ(t, y, y') = 0)
(for #3 and 6 use MATLAB code line
C =[-3:1:3]; t=[-2:0.05:2]; figure, for jj=1:length(C), y=C(jj)*exp(-0.5*t.^2); plot(t, y), hold on, end, hold off ➔ Change the values for C, the values for t, and the equation of the function. Note the use of vector operator t.^2.)
(for #21, 24 use dfield8 and use the mouse to draw some different trajectories, print the result)
(for #25, 26 use MATLAB command eul; see the directions in the MATLAB Code document)
(for #35 use MATLAB command eul, with interval [0, 12] and stepsize 0.05 then print the graph and estimate the amount of bacteria)

Section 2.2 5, 6, 7, 8, 18, 23, 24, 33, 34
(#23 has a typo; equation should be N = N₀e⁻ⁿ  no prime on N)

Section 2.3 2, 5, 8, 9, 12 (➔ not easy), 18
(for #5 Hint: If T is the time for the first half of the trip, then T + 1 is the time for the entire trip.)
(for #8 Hint: a definite integral of the velocity with limits that represent an interval of time for the fall of an object.)

(for #12 Use Eqn (3.15) to rewrite the DE into the form
\[
\frac{v \, dv}{dx} = -g - \frac{r}{m} \cdot v
\]
then separate the variables. You can use an integral form from a table of integrals;

\[
x = \int_0^t v(s) \, ds
\]
\[ \int \frac{y}{a + by} \, dy = \frac{y}{b} - \frac{a}{b^2} \ln(a + bx) \]. It is best to definite integrals in the form
\[ \int_{v_i}^{0} \frac{v \, dv}{mg + v} = -\frac{r}{m} \int_{50}^{0} \frac{dy}{dt} \]
where \( v_i \) represents the impact velocity (which is what you want to find). The result will be an implicit expression in \( v_i \). To estimate \( v_i \) rearrange the expression into the form \( F(v_i) = 0 \) graph the expression and estimate the intercept. A good interval for \( v_i \) is \([-18, -10]\). Remember the impact velocity will be negative.

**Section 2.4** 4, 5, 6, 13, 14, 18, 29, 41, 43 \( \Rightarrow \) Important problem
(for #41 use the method of variation of parameters)
(for #43; Definition of autonomous DE: A first-order autonomous equation is an equation of the special form \( x' = f(x) \)).

**Section 2.5** 1, 4, 5, 6, 7, 12
(for #4 let \( x(t) = \text{amt of salt at time } t \); set up the DE for \( x(t) \); we want to convert the DE to be in terms of the concentration which is \( c(t) = \frac{x(t)}{500} \); make the change of variable in the DE and solve the DE for \( c(t) \))

**Section 2.6** skipped

**Section 2.7** 7 (part(ii)), 9, 10, 12 (part (ii)), 13 (part (ii)), 27, 28

**Section 2.8** skipped

**Section 2.9** 8, 9, 10, 17, 18