1. Section 2.4 # 22 as modified below:

a) Show that the equation is exact.

b) Find the solution of the initial value problem in implicit form.

c) Use Octave to draw the solution of the initial value problem in the window $-3 \leq x \leq 3$ and $-3 \leq y \leq 3$.

d) Add a blue square at $(1, y(1))$ to your plot.

e) Use Octave to determine an approximate value of $y(2)$ for your solution.

f) Add a red square at the location $(2, y(2))$ to your plot.

You should hand in part a), part b), your final plot, and the Octave code you used to generate it.

2. Section 2.4 # 24 as modified below:

a) Show that the equation is exact.

b) Find the solution of the initial value problem in implicit form.

c) Use Octave to draw the solution of the initial value problem in the window $-3 \leq t \leq 3$ and $-3 \leq x \leq 3$.

d) Add a blue square at $(1, x(1))$ to your plot.

e) Use Octave to determine an approximate value of $x(2)$ for your solution.

f) Add a red square at the location $(2, x(2))$ to your plot.

You should hand in part a), part b), your final plot, and the Octave code you used to generate it.

3. Consider the IVP

$$\frac{dy}{dx} = -\frac{e^{2y} + 2x}{2e^{2y}x - 2}, \quad y(0) = 3.$$

a) Write the differential equation in differential form and verify that it is exact.

b) Find the solution in implicit form.

c) Use Octave to draw the corresponding level set.

d) There are two points on the level set with $x = 1$. Find the values of the corresponding y coordinates to 8 digits.

e) Which of these two values is $y(1)$ for your solution? Why?

4. In very cold temperatures, the thickness of ice on a pond increases at a rate inversely proportional to its thickness.

The ice on a pond is initially 0.05 inches thick and 4 hours later is 0.075 inches thick. How thick will the ice be 10 hours after its thickness was initially measured?

5. 3.2 # 19

6. A cabin is initially at 12°C when its heater fails at time $t = 0$. The exterior temperature is $M(t) = 9 + 10\cos(2\pi t)$; time t is measured in days and $t = 0$ corresponds with 2:00pm. Newton's Law of Cooling applies to the cabin, and the heat-loss constant $K = 3$ days^{-1}.

a) Determine an exact formula for the temperature $T(t)$ of the cabin for $t > 0$. *Hint*: There is a hard way and a not so hard way to find the exact solution. Look at your notes on RC circuits.

b) Plot $T(t)$ and $M(t)$ on the same set of axes.

7. 3.4 # 3 (Use Octave's `fzero` to help find the answer).