MATH.2360 Engineering Differential Equations
Homework Problems on Slope Fields

1. You will need the m-file dirfield.m. To download this file, go to our course web page, then click on *Class handouts etc.* under **Course Materials** and scroll down to the MATLAB Handouts section, item 4. Right-click "dirfield.m" click on "Save Target As" (or Save Link As depending on which browser you use) and save the file. Take note of where you saved the file.

2. If you don't have your textbook with you, you should look at the homework assignment for this section, also under item 4 in the MATLAB Handouts section of the *Class handouts etc.* page.

3. Start MATLAB and change directories to the directory where you saved dirfield.m. To change directories, click on the toolbar icon that looks like a file folder with a green arrow coming out of it.

4. Before you use dirfield, you will need to create a file defining the right-hand side of the d.e. whose slope field you want. Click on *New* on the toolbar, then click *Script*. An Editor/Debugger box will open on the screen. For homework problem 1 from section 1.3, type in the following three lines (including the last line with the word end):

   ```
   function z = f(x, y)
   z=-y-sin(x);
   end
   ```

   (Don't forget the semicolon at the end of the second line.)

   Save the function file using the name f.m

5. In the MATLAB command window, type the command `dirfield(@f, -3, 3, -3, 3)`

6. In response to the prompt in the command window, enter the point `[-2.5, 2]` and hit *Enter*.

7. Repeat the procedure in the last step to enter the following points, one at a time:
   `[-1.5,2], [-0.5,2], [0.5,2], [1.5,2], [2.5,2], [-2.5,1], [-2,-2], [-1,-2], [0,-2], [1,-2], [2,-2]`
   After you enter the last point, just hit the Enter key with no input in response to the prompt.

8. Click on *Edit* on the Figure window toolbar, then click on *Copy Figure*. Open a Word document and paste in the figure you just copied.

9. For problem 2, edit your f.m file and make the second line `z=x+y;`

10. Run dirfield and generate solution curves through the points indicated in problem 2.

11. Copy the figure to your Word document.

12. For problem 7, edit your f.m file and make the second line `z=sin(x)+sin(y);`

13. Run dirfield and generate solution curves through the points indicated in problem 7.

14. Copy the figure to your Word document.

15. Please email the Word document to me at `stephen_pennell@uml.edu`.