

Lab 04 Expectations

Submit Plots: 4, 5

Submit Code: 1, all parts of 2.

1. Using MAPLE solve each initial value problem. Provide code and the solutions.
2.
 - a. Use dsolve in Maple to find $f(x)$ and $g(x)$. Provide code and solutions.
 - b. Substitute the equations into (**) to make sure these functions satisfy the differential equation. Provide code.
 - c. Substitute $h(x)$ into the left side of (**). What do you get? Provide code.
 - d. Prove that if $f(x)$ and $g(x)$ are arbitrary solutions to (*), then $h(x)=f(x)-g(x)$ is a solution to (*). Note that these are not the $f(x)$ and $g(x)$ from part a, use a variable i.e. $y(0)=c$ to create a general solution. Provide code.
 - e. Substitute $F(x):=yh(x) + g(x)$ into the left side of the differential equation. What do you get? Provide code.
 - f. Use dsolve to find the general solution to $y' + x^3y = x^3$. Does this expression you get describe the same set of solutions as in (e). Explain. Provide code.
3. Using dfield, plot several solutions to the differential equation $y' = y^2$. Does the place where they cease to exist seem to depend on initial conditions? You may include your graph if it helps your explanation.
4. Using dfield plot the IVP curves corresponding to $y(0)=1$, $y(0)=100$ and $y(0)=1000$. Are all solutions unbounded near $x=2$? How does the differential equation make you expect this?
5. Use dfield to plot the solution to the given IVPs. Is there a point where the solution is not unique? Why would you expect this? How do the solutions differ? Include one or two graphs, as long as all solutions are visible.