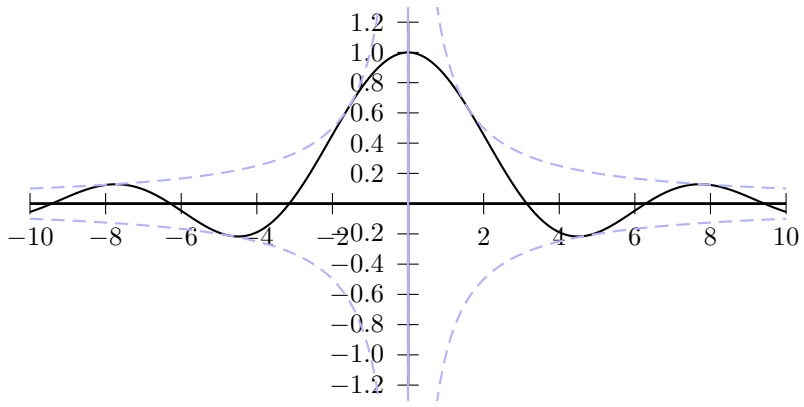
Math 291
Lab 11
Due April 29, 2019

Instructions: Use LaTeX to typeset a document containing each component described below. Turn in your lab in D2L Brightspace. You should submit your raw TeX (.tex) file and your compiled document. Do *not* submit a .zip file.

You will be graded on both your raw TeX code and the accuracy of your compiled document. **Don't forget to include Lab11 in your filename and include a four-line name block similar to the one you did for earlier labs**.

1. Create the following graph, using the First Example as a reference. Note that for the grid, $|x| < 11$ and $|y| < 1.3$, which you can use to help set the size of the pspicture* environment. The function that is graphed in black is $f(x) = \dfrac{\sin(x)}{x}$. You should be able to use that to figure out what functions are being graphed in light blue.



2. Create a Lissajous figure (as in the Second Example) where you are using cosines instead of sines and for the coefficients of the x, one should be the number of letters in your first name as indicated on this lab, and the second should be the number of letters in your last name, again as you indicate it on this assignment. Use the plotpoints option and choose enough points so that your Lissajous figure is visually smooth.

3. Following the example of the Third Example, graph the similar picture for $f(x) = \cot(x)$. Make the appropriate changes to have the visible y-scale go from -5 to 5 and to move the asymptotes to the correct location. Hint: $\cot(x) = 1/\tan(x)$.

4. Following the example of the Fourth Example, plot the polar function $r = 1.25 - 3.75\cos(\theta)$. Make the appropriate changes so that the graph fits on the background grid.

5. Using the form seen in the Fifth Example, plot the polar function $r = 6\sin\left(\frac{5}{4}x\right)$. Make sure that you make the appropriate adjustments to get the entire graph. Also, add an rput command to put $r = f(\theta)$ somewhere in the first quadrant where it does not overlap the curve.

6. Note that in the polynomials that you use psPolynomial with, the coefficients are given for the terms in increasing degree (constant term first, ending with the leading coefficient). Knowing this, plot the polynomial $h(x) = x^4 + 4x^3 - 14x^2 - 36x + 45$ and its first and second derivatives on the same graph, as in the Sixth Example. Mark the zeros for both the first derivative and the second derivative, but change the dotstyles to diamonds. Also draw the zeroLines to the previous derivative (so from the zeros of the first derivative to the original function and from the zeros of the second derivate to the first derivative). Use different colors for each graph, make the color of the label match, and make sure that the labels are appropriately placed. Note that you will need to adjust the scales for both what is plotted and for the units used in each direction. I suggest using an x-range of $[-7, 5]$, but I will let you discover an appropriate y-range yourself.

7. Following the pattern of the Seventh Example, use psplotImp to plot the solution to $(1.2x^2 + 2.9y^2)^2 + 5(-0.4x^3 + 2.9y^3) + 2y = 0$. Also, use the uput* command to include the equation itself in the graphic, making sure that it does not overlap any part of the plotted curve.

8. Using the Eighth Example as a guide, use psVolume to draw the disks for when the graph of $f(x) = 4 - x^2$ is rotated about the x-axis on the interval $[-2, 2]$. Give two illustrations, once with four disks, and once with 20 disks. Use a different fillcolor in your two graphs.