

### Math 111, Introduction to Maple Homework, Due Wed Sep 3

**Directions:** To complete this assignment, feel free to refer back to *Introduction to Maple Homework*, the “Help” menu in Maple or consult with your fellow classmates. Open a blank maple sheet in document mode and *enter each question into Maple* in text mode (but switch to Math mode to write mathematical expressions). Following each question use Maple’s execution group to perform each calculation. Be sure to put your name and the title “Introduction to Maple Lab” at the top of the sheet. (NOT by a pen or pencil but with Maple text mode!). Print out your Maple worksheet and turn in the hard copy.

1) Give the decimal approximation of  $e^{2\cdot\pi}$  to 20 decimal places. (Note: it is safest to enter the exponential function  $e^x$  as  $\exp(x)$ )

2) Find the factorization of the polynomial  $x^4 + 6x^3 - 3x^2 - 16x + 12$

3) Define the function  $f$ , given by  $f(x) = x \sin(\frac{1}{x})$  in Maple (as a function using the array notation, not as an expression). Then determine the exact value and the decimal point approximation up to 20 places of  $f(\frac{2}{\pi})$ .

4) Plot the function defined in the previous problem using a window size of  $x$  from -1 to 1 and  $y$  from -1 to 1. Make the plot color blue and give the title “My First Plot”.

5) Let  $g(x) = x^2 + 0.2$ . Again, define  $g$  as a function. Plot  $f(x)$  and  $g(x)$  together on the same window from  $x = -1$  to  $x = 1$ . At how many points do they appear to intersect? Solve the equation  $f(x) = g(x)$  to find those points. Do you get them all? Learn more about the `fsolve` command to find all of the points of intersection.

6) A parcel delivery company will deliver a package only if the girth (distance around the package, which is  $2 \cdot (\text{side for square base} + \text{height})$ ) does not exceed 108 inches. A package company wants to design a box with square base ( $x$  by  $x$  inches) that will have a maximal volume and will meet the delivery services restriction.

a) Determine a formula that would describe the volume of such a box as a function of  $x$  and define it in Maple as a function, named  $V$ .

b) Considering the physical limitation imposed by the company, what will be the domain of the function  $V$ ? Plot the function on this domain.

c) From the graph, estimate the dimension of the box with maximal volume.

d) What is the maximal volume corresponding to the value of  $x$  found in the last part?