Math 172 Computer Lab I (Maple)

In this lab you will learn basic Maple commands and use them to calculate areas.
(NOTE: you do not have to email or print any Maple worksheets for this lab.)

Key Commands: plot, solve, fsolve, Int, value

Introduction to Maple

Maple is a powerful system that does everything a basic graphing calculator does, plus a whole lot more. We begin with a few general rules on syntax:

a) every command in Maple must be followed by a semicolon (;)
b) to name an expression, such as f, use a colon, followed by the equals sign (f := · · ·)
c) all multiplication MUST be declared; i.e., you must type 3*x, not just 3x

IMPORTANT! To learn the syntax for a command, type a question mark followed by the command name. For example, to learn how to plot a graph, type ?plot in your Maple worksheet

1. Write down a command that correctly plots the graph of $f(x) = x^2 + 5$ from $x = -2$ to $x = 3$.

We will now create the tools needed to compute area between curves in Maple. The steps are the same: plot the curves, find the intersection points, and integrate. The only difference is that we will let Maple do the (non-thinking) work for us.

2. Write down a command that correctly plots the graphs of $f(x) = \cos x$ and $g(x) = \sin x$ on the same set of axes from $x = 0$ to $x = \pi$.

3. Write down a command that correctly finds the point of intersection of the curves. (HINT: which Key Command above will do this?)

4. Write down a command that correctly integrates to find the area bounded by the curves $y = \sin x$, $y = \cos x$, $x = 0$, and $x = \pi$. (I recommend using the Int command to see the integrals first. If you typed it correctly, use value(%) to evaluate it. % is like the ”Ans” on a graphing calculator).
5. Use *Maple* to find the area of the region bounded by the following curves. Either print and attach a copy of your Maple worksheet, or list the commands you entered and the final answer in the space below.

a) (7.1 #48) $y = x^4 - 1, y = x \sin(x^2)$ (HINT: Use fsolve instead of solve).

b) (7.1 #51) The curve with equation $y^2 = x^2(x + 3)$ is called **Tschirnhauser’s cubic**. Find the area of the loop enclosed by the graph of this equation. (HINT: What 2 functions make this curve?)
c) \( N(x) = \begin{cases} 
0 & \text{if } 0 \leq x < 6 \\
9.5 & \text{if } 6 \leq x < 11.5 \\
-0.07143x^3 + 2.94x^2 - 40.5x + 190.643 & \text{if } 11.5 \leq x < 15 \\
3.5 & \text{if } 15 \leq x < 18 \\
-0.034x^3 + 1.8482x^2 - 33.2x + 200.2 & \text{if } 18 \leq x < 22 
\end{cases} \)
and
\( S(x) = \begin{cases} 
-0.075x^2 - .95x & \text{if } 0 \leq x < 4 \\
-0.082x^3 + 1.712x^2 - 11.35x + 18.2 & \text{if } 4 \leq x < 8 \\
.05x^3 - 1.775x^2 + 19.25x - 70.6 & \text{if } 8 \leq x < 12 \\
.025x^3 - .775x^2 + 6.05x - 13 & \text{if } 12 \leq x < 16 \\
.1x^3 - 5.976x^2 + 119.15x - 798.6 & \text{if } 16 \leq x < 22 
\end{cases} \)

If you list your commands, do not include the lines where you defined these functions! Use \texttt{piecewise} to learn how to enter piecewise-defined functions like these. Explain why I asked you this problem. (HINT: If you can’t answer this, you didn’t follow all the steps!)