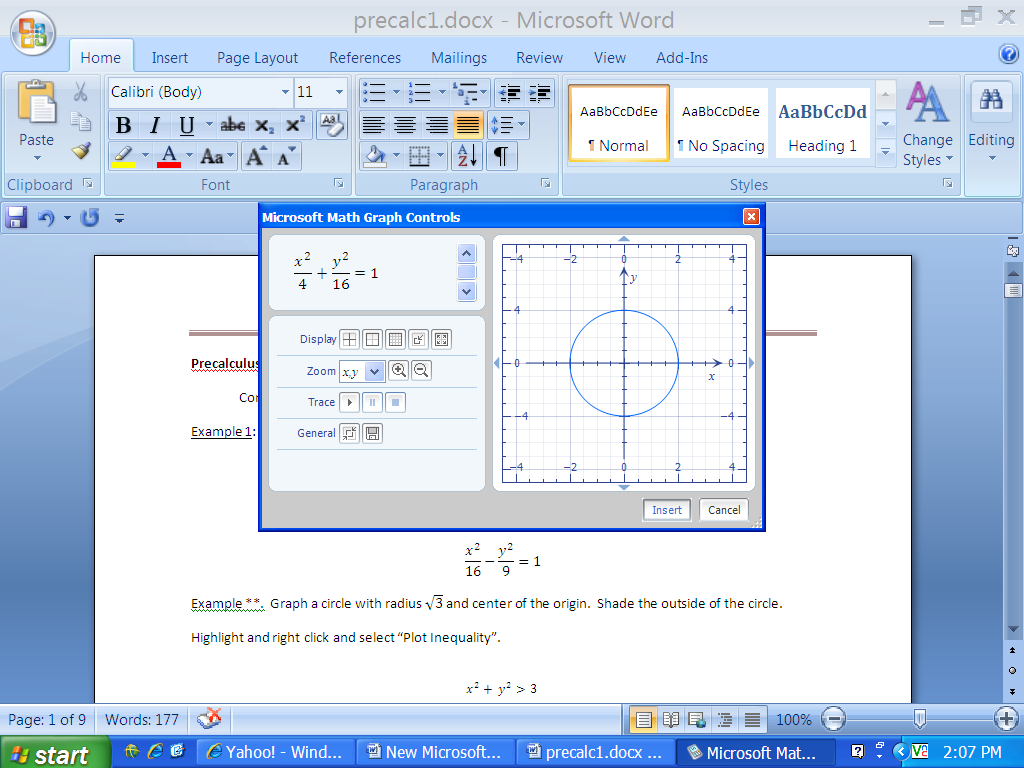
**Precalculus**

Conic Sections

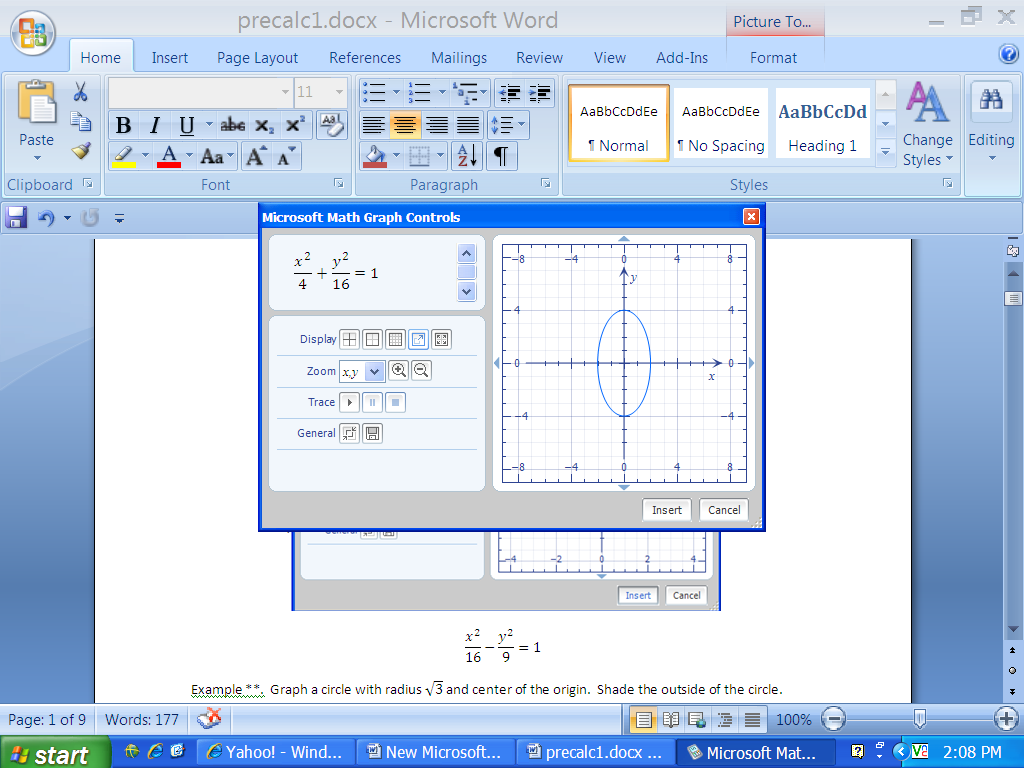
Example 1: Graph an ellipse.

Selecting *Plot in 2D* gives the graph. The graph is a little misleading. It is not a circle. The distance for a unit length is different on the *x-axis* versus the *y-axis.* To make the graph proportional, click on the fourth button in the *Display* row.

Toggles graph to be in and out of proportion.



The new graph is:



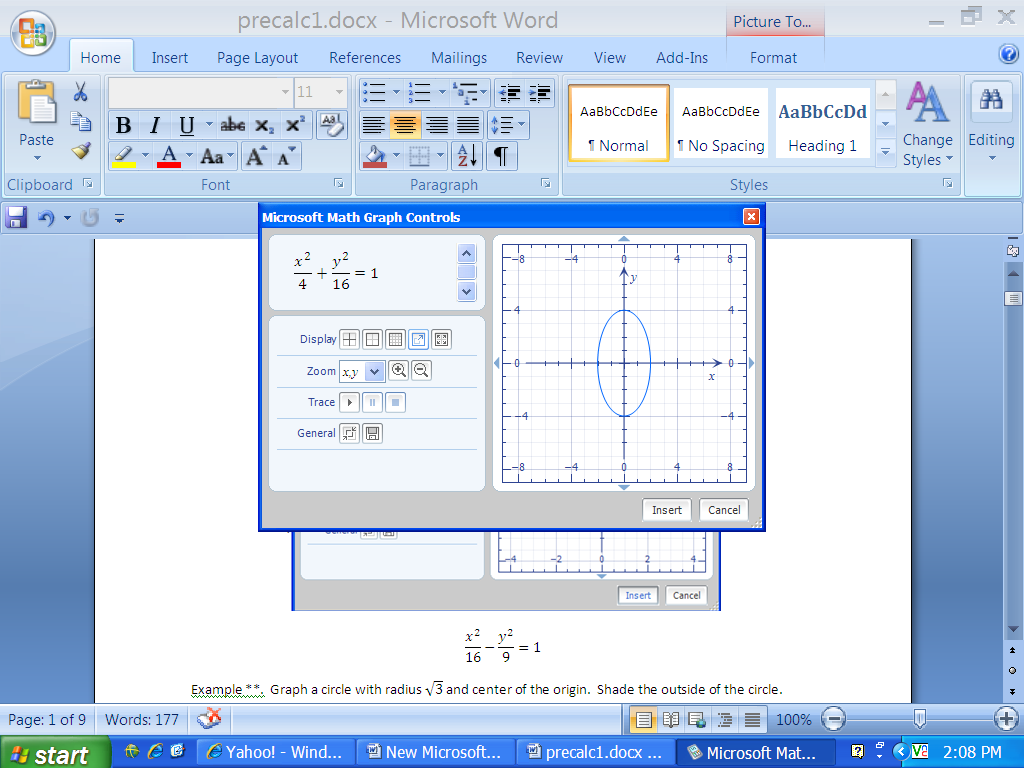
Note that there is new labeling on the axes. The *Display* row can furthermore be used to alter how the graph is displayed.

Show grid lines (yes/no)

Diplay units on the perimeter (yes,no)

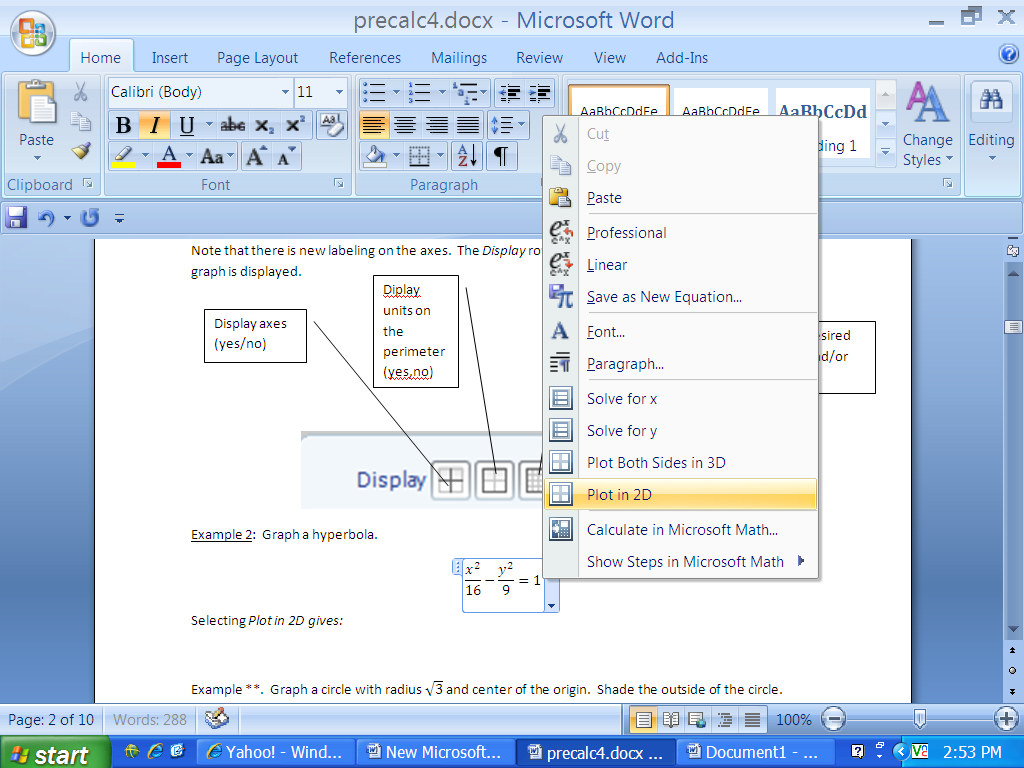
Insert a desired domain and/or range.

Display axes (yes/no)



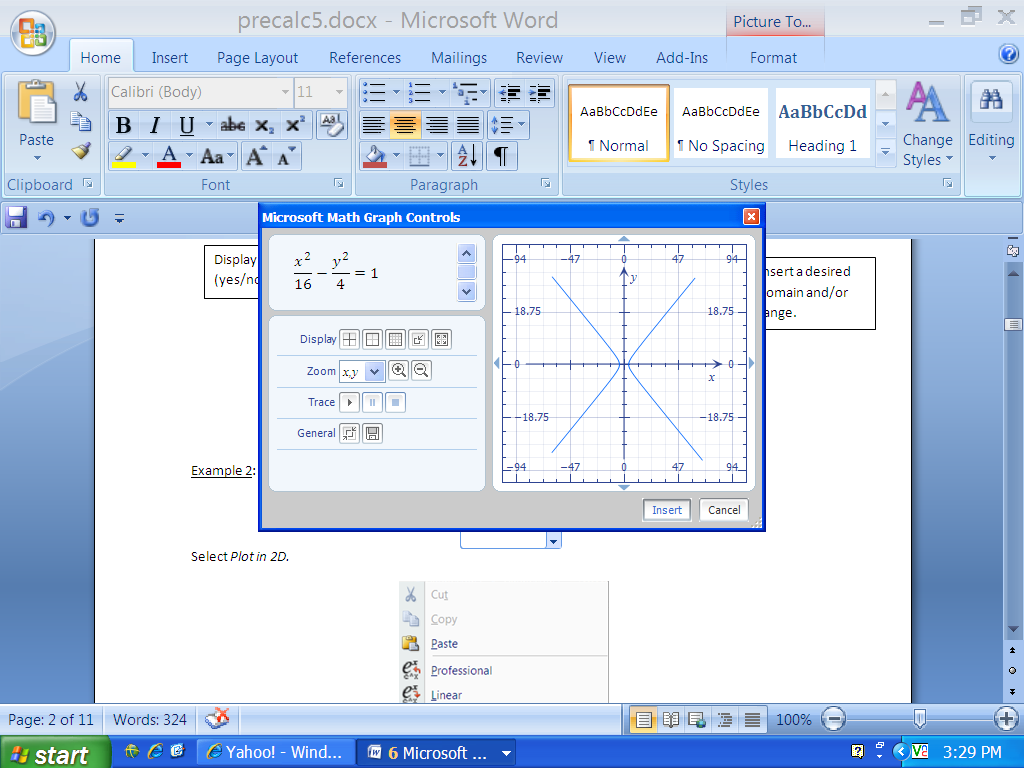
Example 2: Graph a hyperbola.

Select *Plot in 2D.*

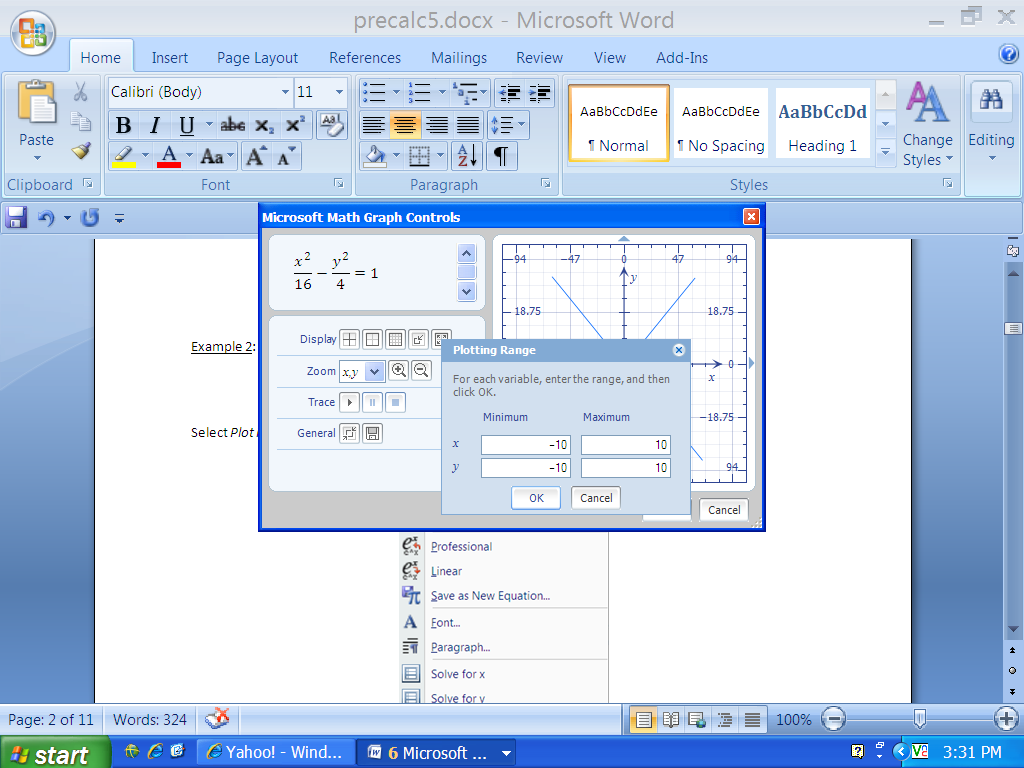
**

Alternately, you can use the command:

The insertion of will control the plot range. However, the original equation can be inserted and the plot range established by using the last button on the *Display* row.

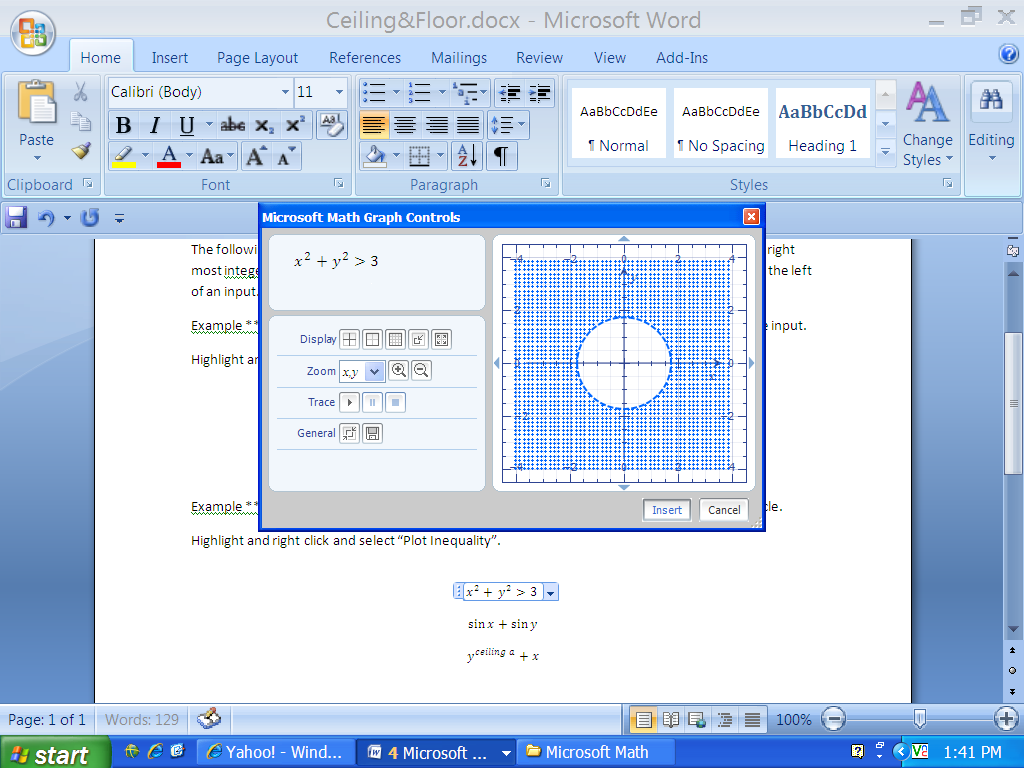


Insert the desired minimum and maximum values here.



Example 3: Graph a circle with radius and center of the origin. Shade the outside of the circle.

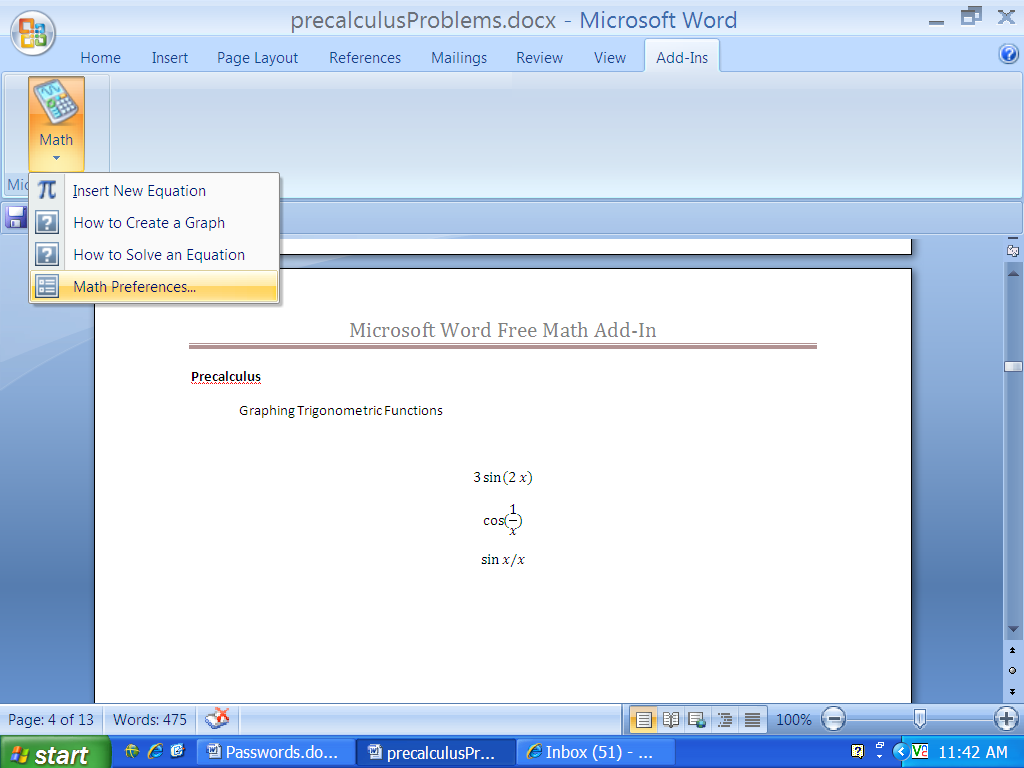
Highlight and right click and select “Plot Inequality”.



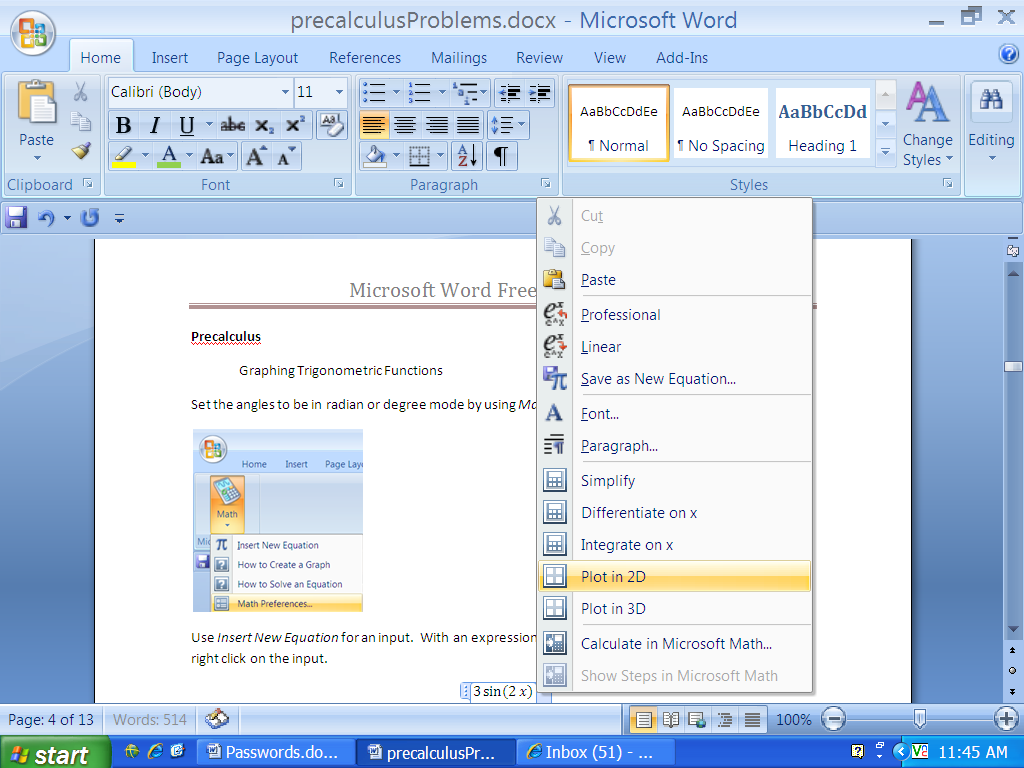
**Precalculus**

Graphing Trigonometric Functions

Set the angles to be in radian or degree mode by using *Math Preferences*.

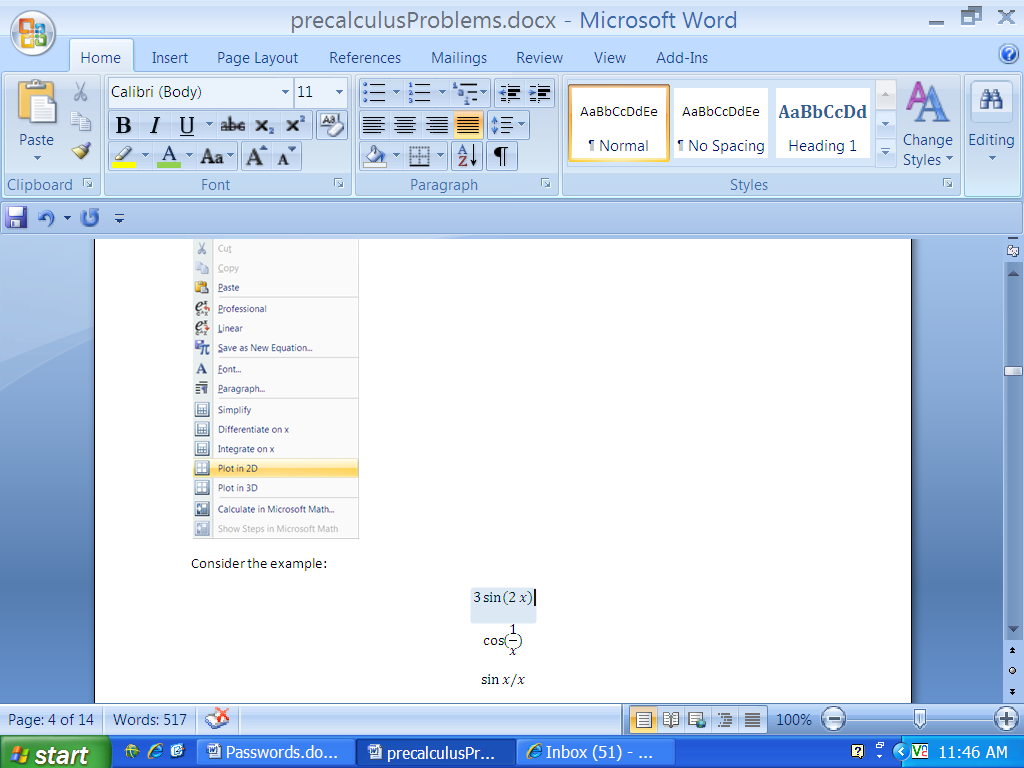


Use *Insert New Equation* for an input. With an expression, the option of *Plot in 2D* will appear after a right click on the input.

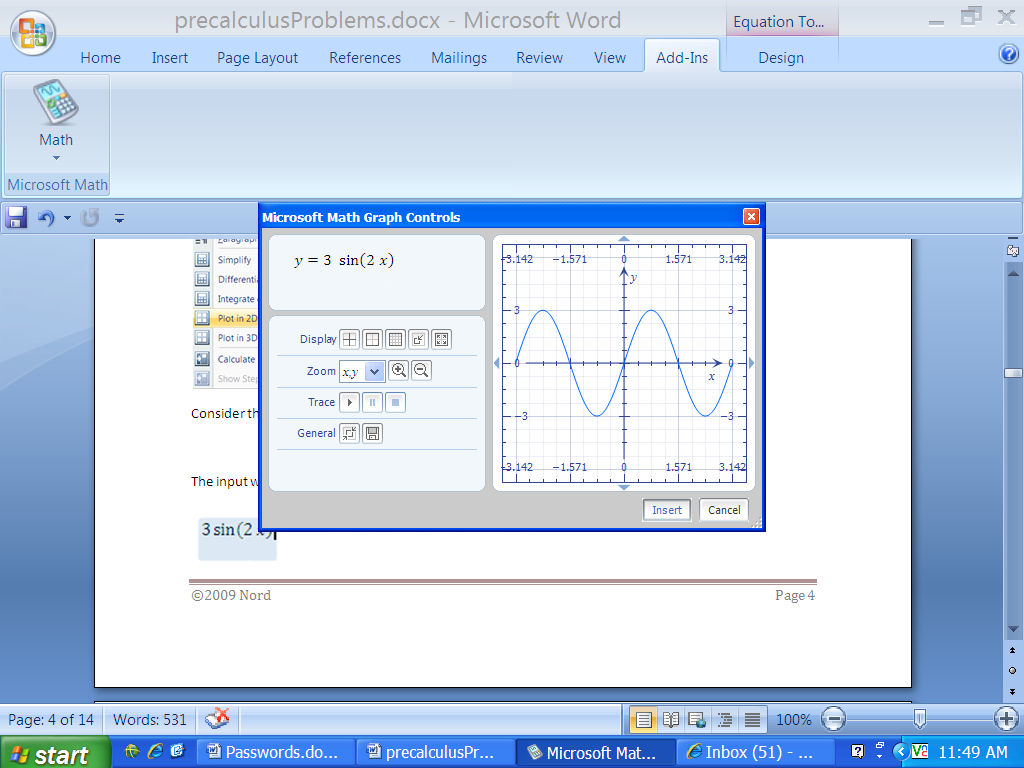


Consider the example:

The input will appear in blue as shown:



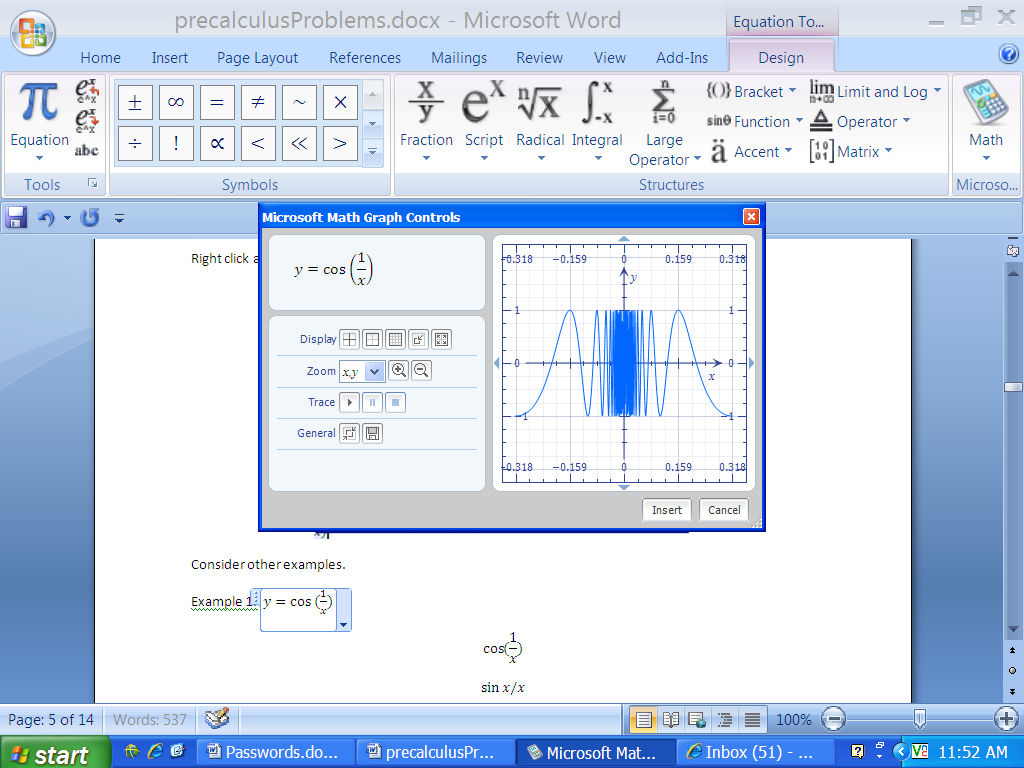
Right click and yield the graph:



Consider other examples.

Example 1: Graph .

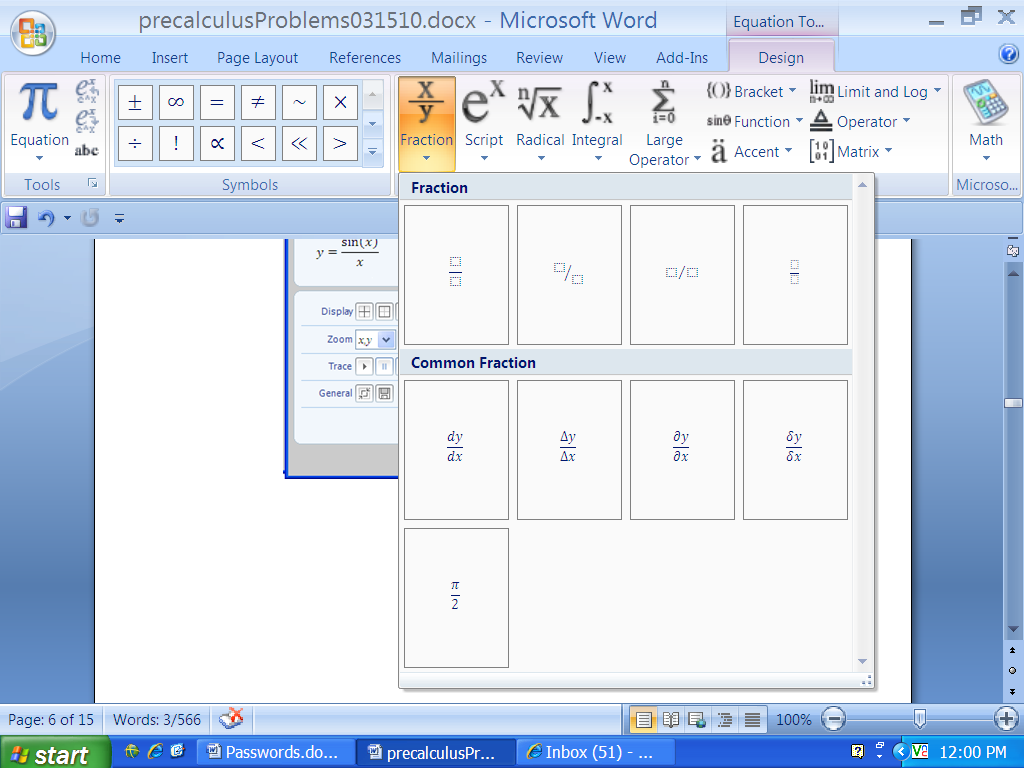
The option *Plot in 2D* also appears if the input is in the form of an equation. The graph is:



Example 2: Graph .

The graph is:

Use the *Fraction* option as a possible way to enter. Notice that *sin* is recognized. To enter the argument after *sin,* press the space bar.



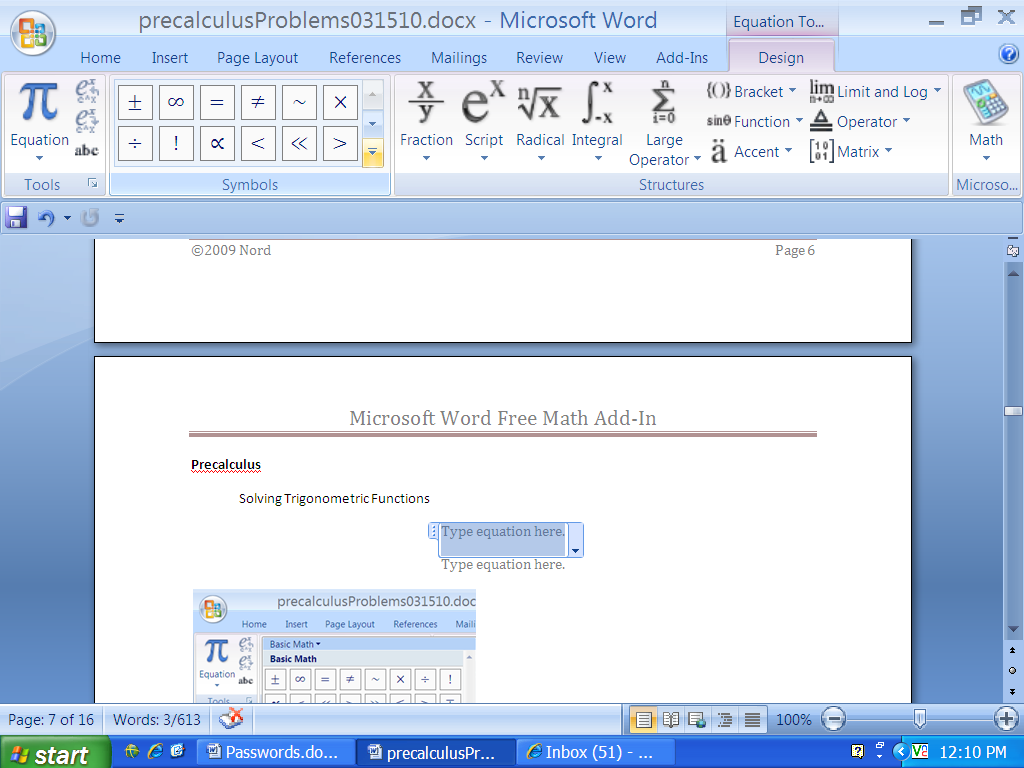
For our example, the graph is undefined at *x=0.* However, the graph appears continuous.

**Precalculus**

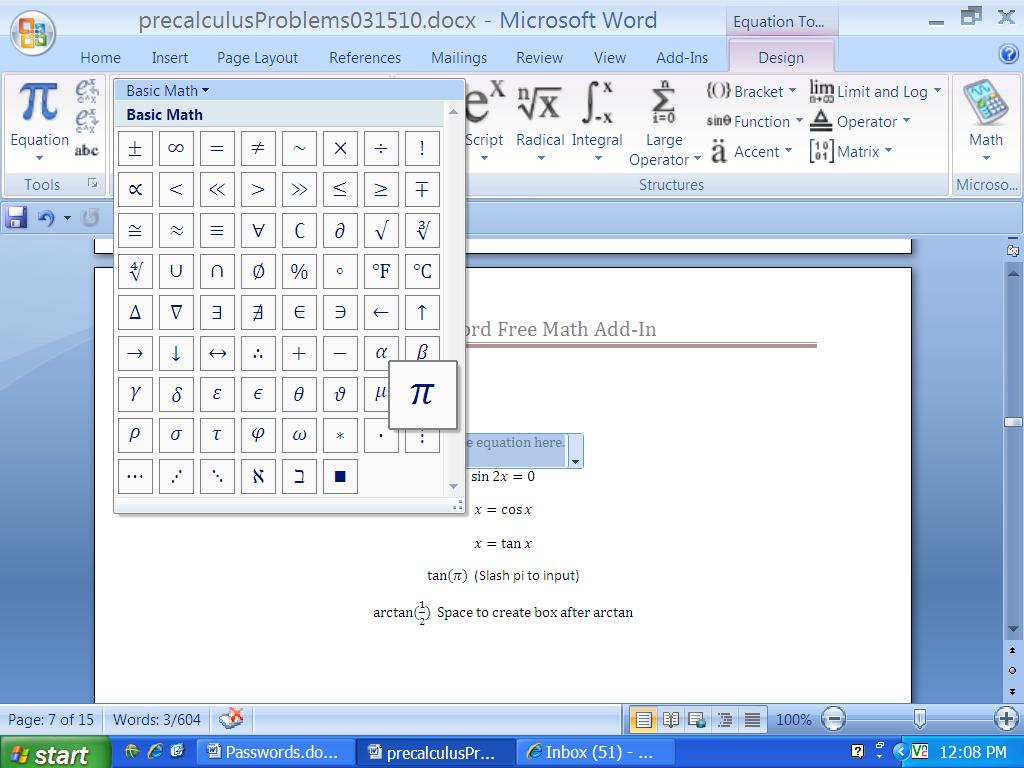
Solving Trigonometric Functions

To input a popular symbol, use the down arrow key.

This will bring up the **Basic Math** feature.



The *Basic Math* feature will appear, and will be an option.



Alternatively, in the *Insert New Equation* line type, “\pi” followed with the space bar. The input will automatically change to, “”.

Consider some trigonometric equations and their solutions.

Example 1:

Select *Solve for x* to yield:

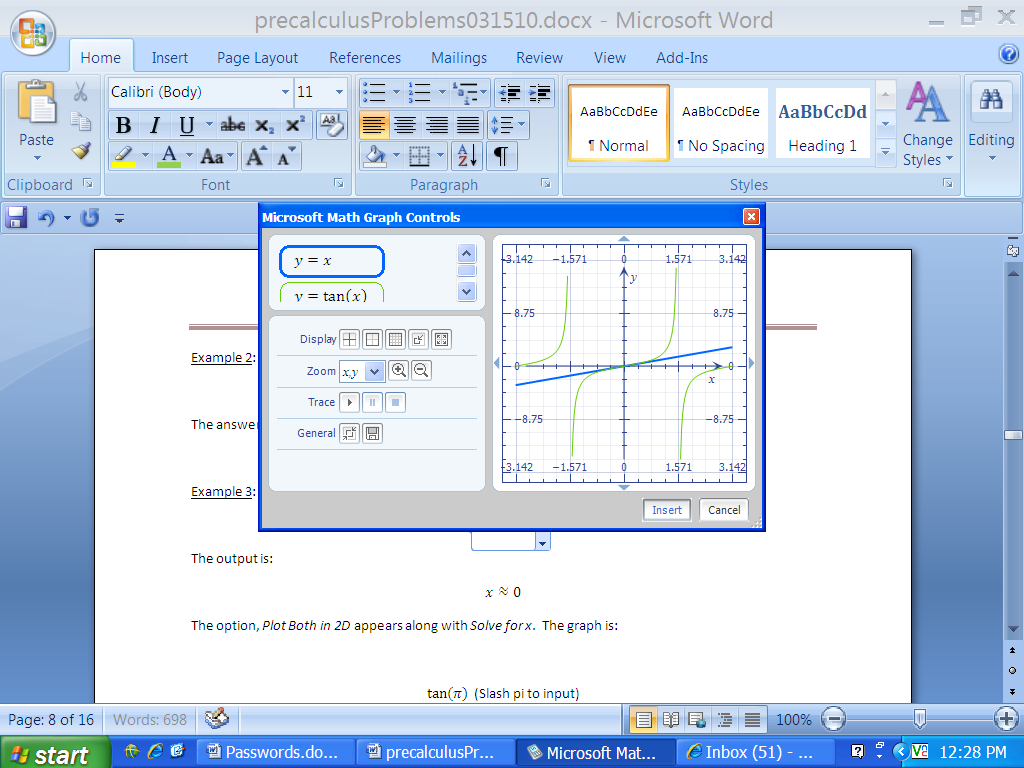
Example 2:

The answer in radians is:

Example 3:

The output is:

The option, *Plot Both Sides in 2D,* appears along with *Solve for x*. The graph is:



The answer is *zero*.

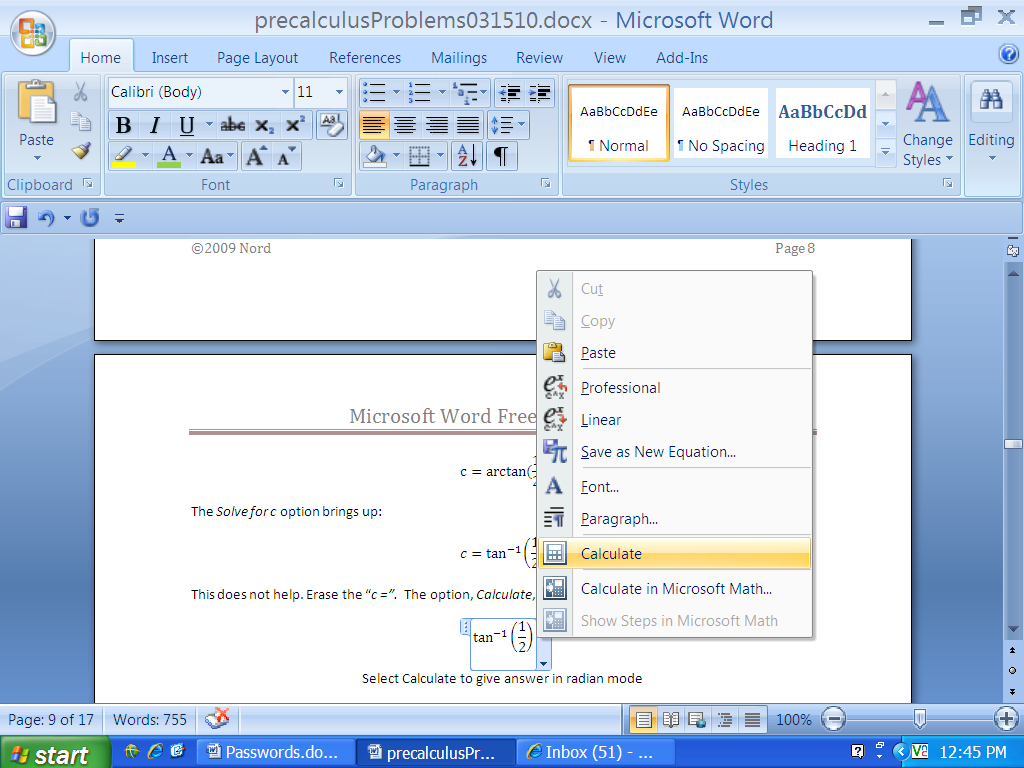
Example 4: Solve for the indicated variable. Solve for *b.*

The answer is:

Example 5: Solve for the indicated variable. Solve for *c.*

The *Solve for c* option brings up:

This does not help. Erase the “*c =”.* The option, *Calculate*, will appear.



Select *Calculate* to give the following answer in radian mode:

Select *Calculate* to give the following answer when the *Math Preferences* are set to *Degrees:*

**Precalculus**

Complex Numbers

Example 1: Find the modulus of a complex number.

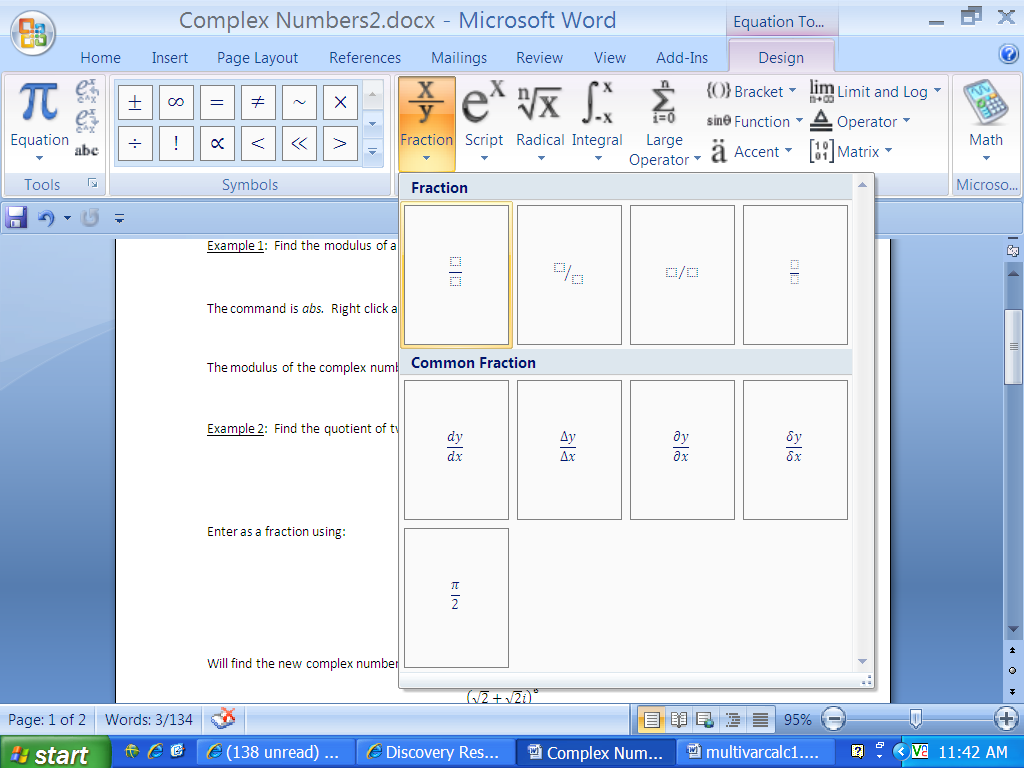
.

The command is *abs.* Right-click and select *Calculate*.

The modulus of the complex number is:

Example 2: Find the quotient of two complex numbers.

Enter as a fraction using:



The letter is recognized equal to . Right-click and select *Calculate*. The answer is the complex number:

Example 3: Raise a complex number to an exponent that is a natural number.

Right-click and select *Calculate* to give:

Example 4: Simplify using two different approaches (Zill and Cullen, 2006 , p. 802).

Right-click and select *Calculate* to give:

Apply DeMoivre’s Theorem, , for another approach. Let *r=2* and and obtain the same answer.

Example 5: Given a complex number, convert it to the polar form, .

Use the command *topolar*. Input the complex number, *a + bi*, following the command. Below is an example input and output.

The command *toRect* changes a number from polar form to rectangular form. The *Calculate* option from the pull-down menu will execute without the needed command *toRect*. This is an example input and output.

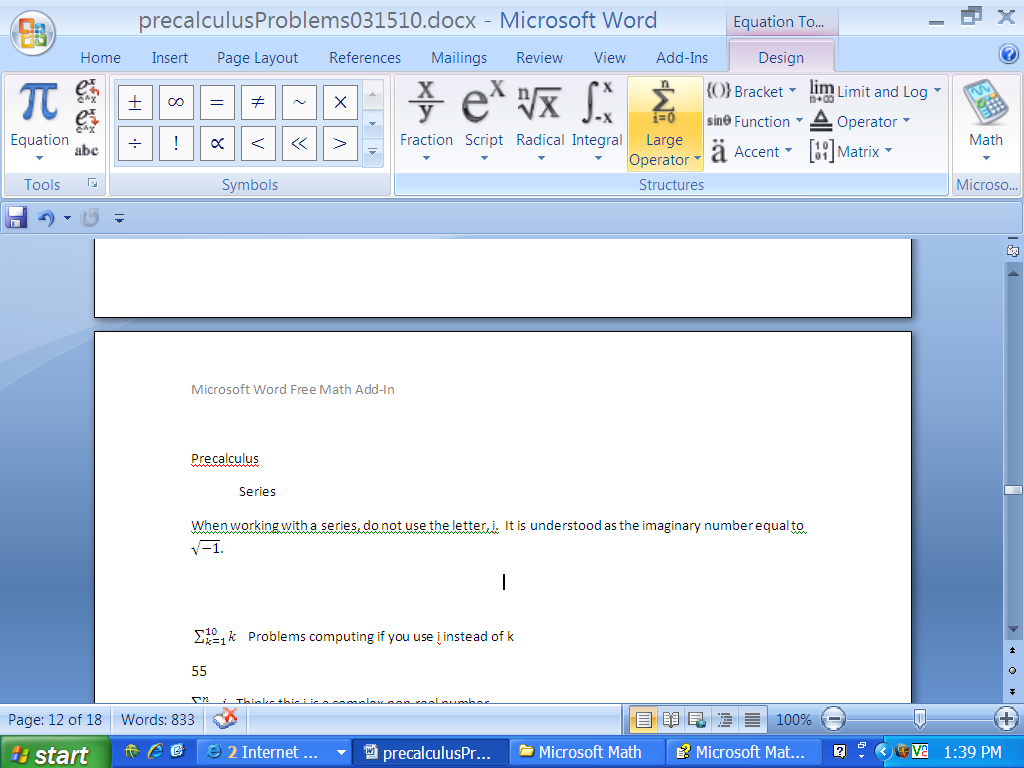
**Reference**

Zill, D. and Cullen, M. Advanced Engineering Mathematics, third edition, Jones and Bartlett, Sudbury, Massachusetts, 2006).

Precalculus

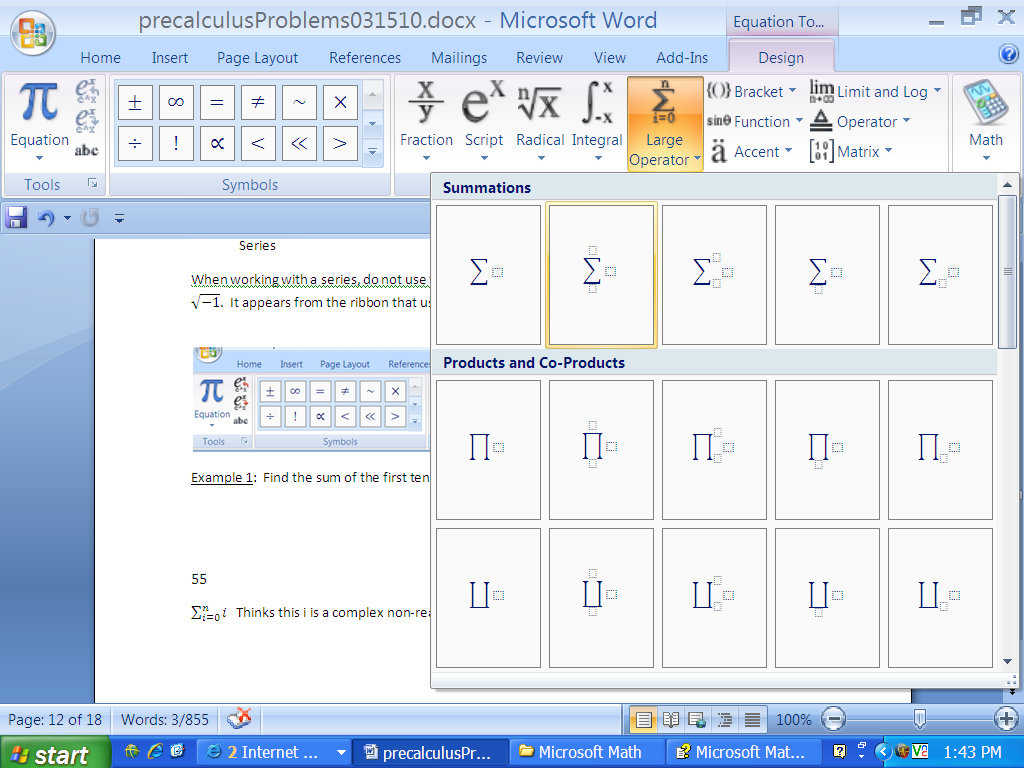
Series

When working with a series, do not use the letter, *i*. It is understood as the imaginary number equal to . It appears from the ribbon that using the letter *i* as a counter is acceptable. It is not.



Example 1: Find the sum of the first ten positive integers.

Insert the series using a summation.



Right-click and select *Simplify* to yield:

Example 2: Find a formula to sum the first *n* positive integers.

The output is:

Example 3: Find the sum of the square of *n* integers.

The output is:

Use the command *Factor* out the previous output.

The *Simplify* command yields:

Example 4: Find the sum of cube of *n* integers.

The output is:

Using the Factor command with this output yields:

Example 5: Use the *seriessum* command.

The command *seriessum* is one word followed by a description of each term, the increment variable, the starting value for the variable, and the ending value for the variable. An example is:

The *Simplify* command gives:

Precalculus

Overview with Examples

Example 1: Solve an equation for *x*.

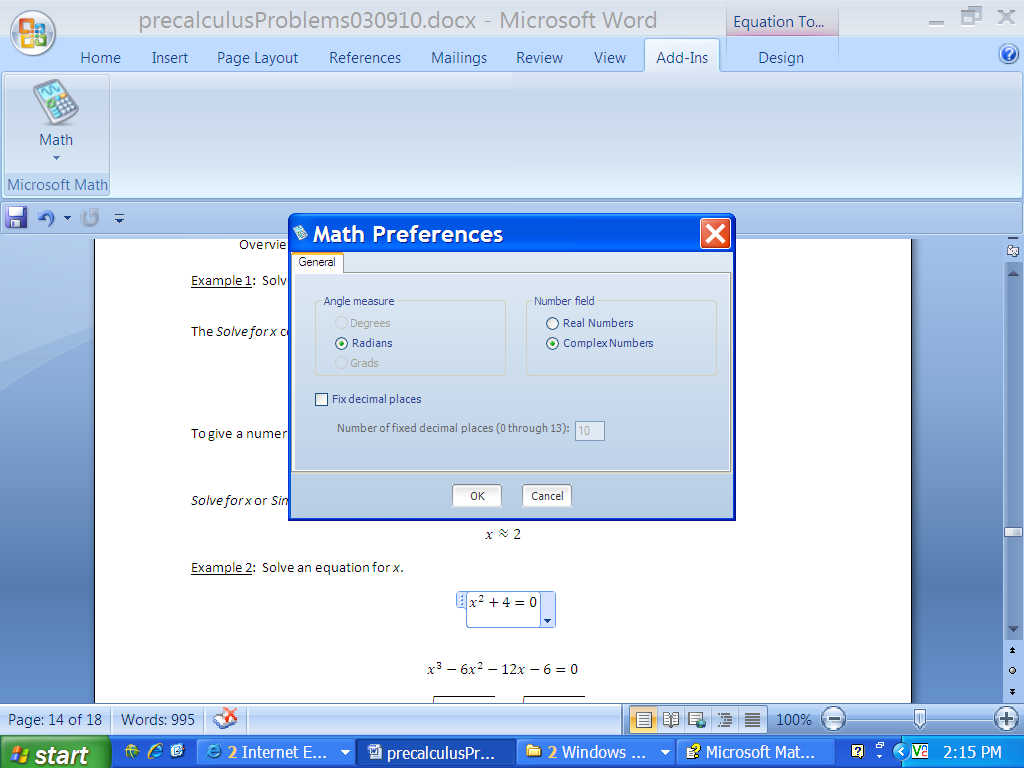
The *Solve for x* command yields:

To give a numerical solution, use the *nsolve* command.

*Solve for x* or *Simplify* yields:

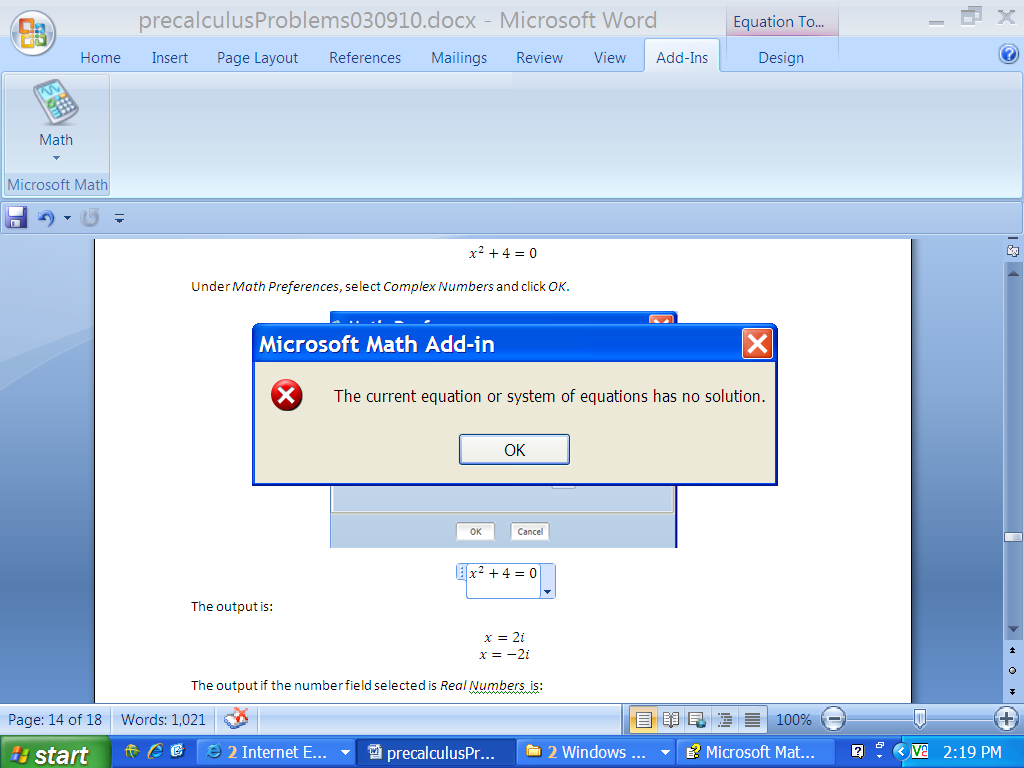
Example 2: Solve an equation for *x* that will yield an answer containing a non-real number.

Under *Math Preferences*, select *Complex Numbers* and click *OK*.



The output is:

The output if the number field selected is *Real Numbers* is:



Example 3: Solve an equation with a degree 3 polynomial.

The *Solve for x* command yields:

To give a numerical solution use the *nsolve* command.

The output is:

The nsolve command can be used with more than one equation. The user may opt to specify a variable with specific search window. The input is *nsolve*({eq1, eq2, …}),{var1,varmin, varmax},{var2, var2min, var2max},..}). An interval is elective. If a variable is specified with one number, then the search will occur around this value.

Below are some examples with the output provided.

Example 4: Specify an interval or target value for a solution for *x*.

Input:

Output:

Input:

Output:

The next example will use a target place to look for the solution. An interval is not needed.

Input:

Output:

Example 5: Use the *nsolve* command and specify an interval for a variable. Use more than one equation.

Input:

Output:

Example 6: Multiply polynomials.

Input:

The *Expand* command yields:

Example 7: Find the integer roots of a polynomial.

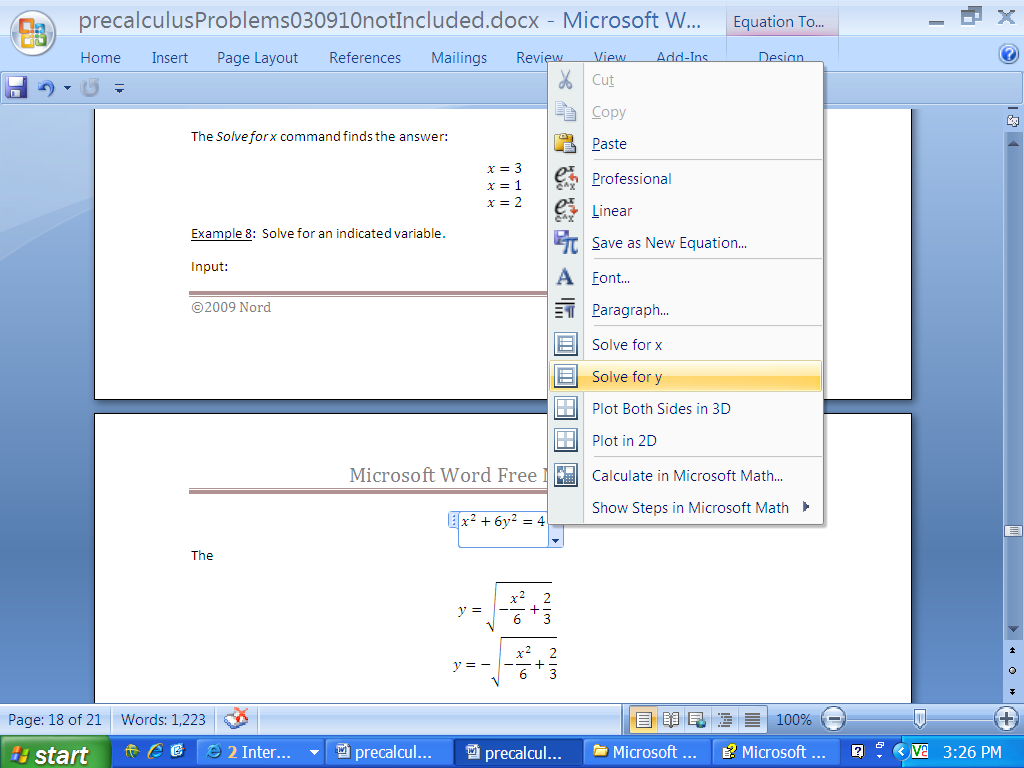
Input:

The *Solve for x* command finds the answer:

Example 8: Solve for an indicated variable.

Input:

The screen will show:



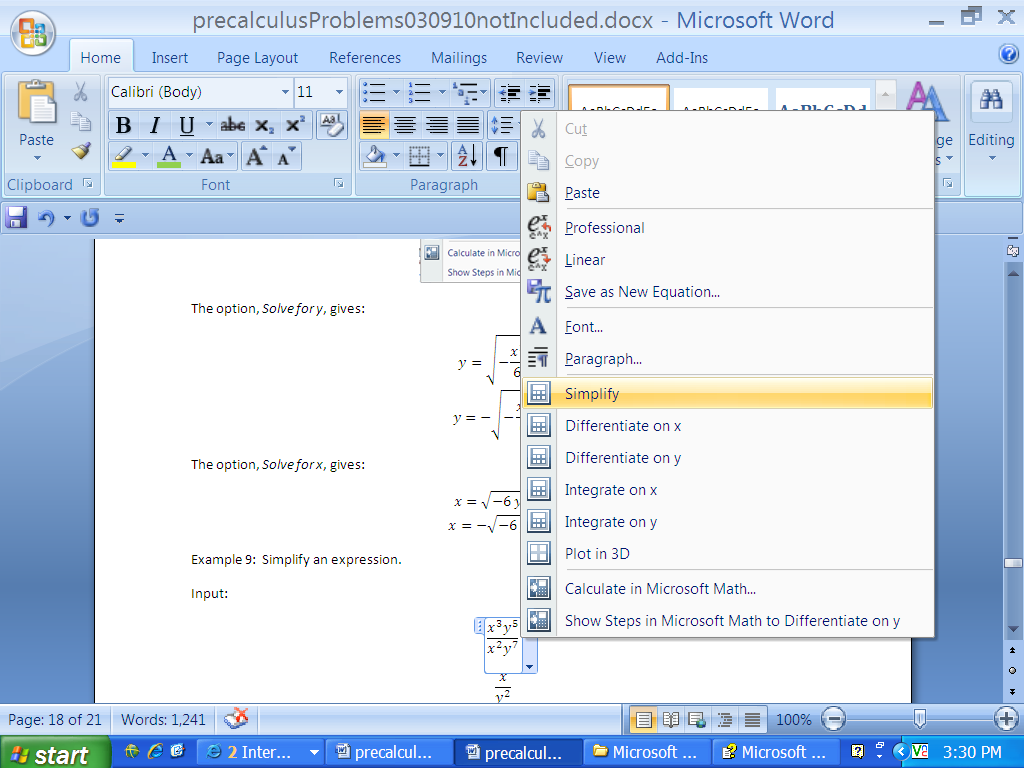
The option, *Solve for y*, gives:

The option, *Solve for x*, gives:

Example 9: Simplify an expression.

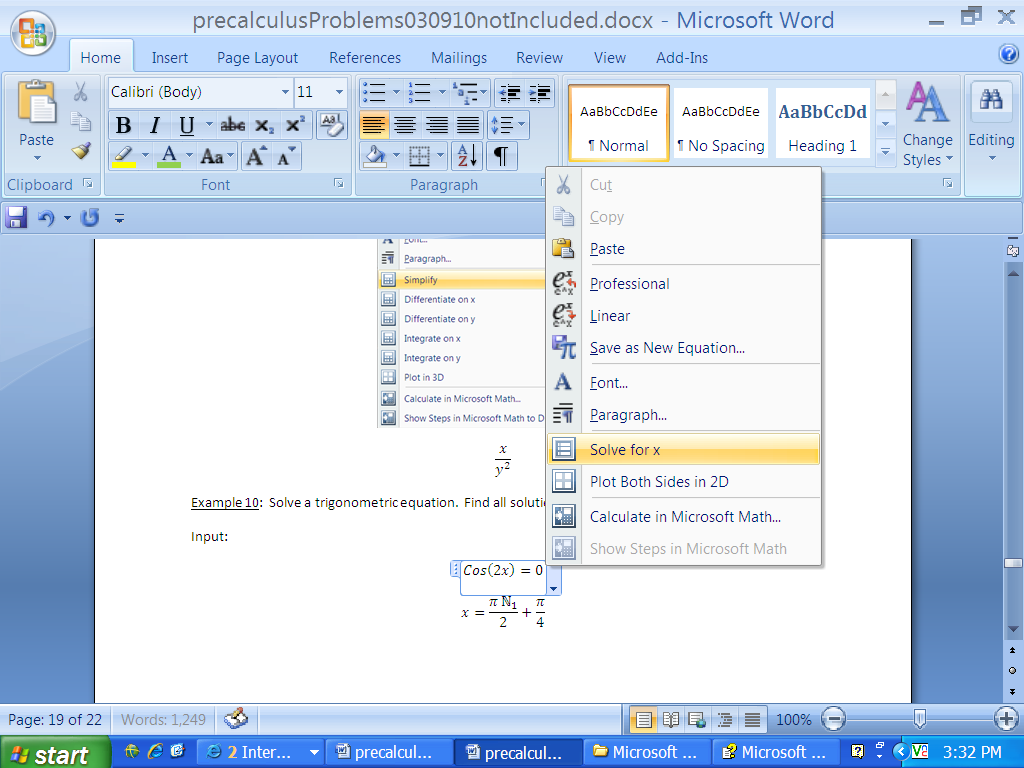
Input:

The option, *Simplify*, will yield:



Example 10: Solve a trigonometric equation. Find all solutions.

Input:



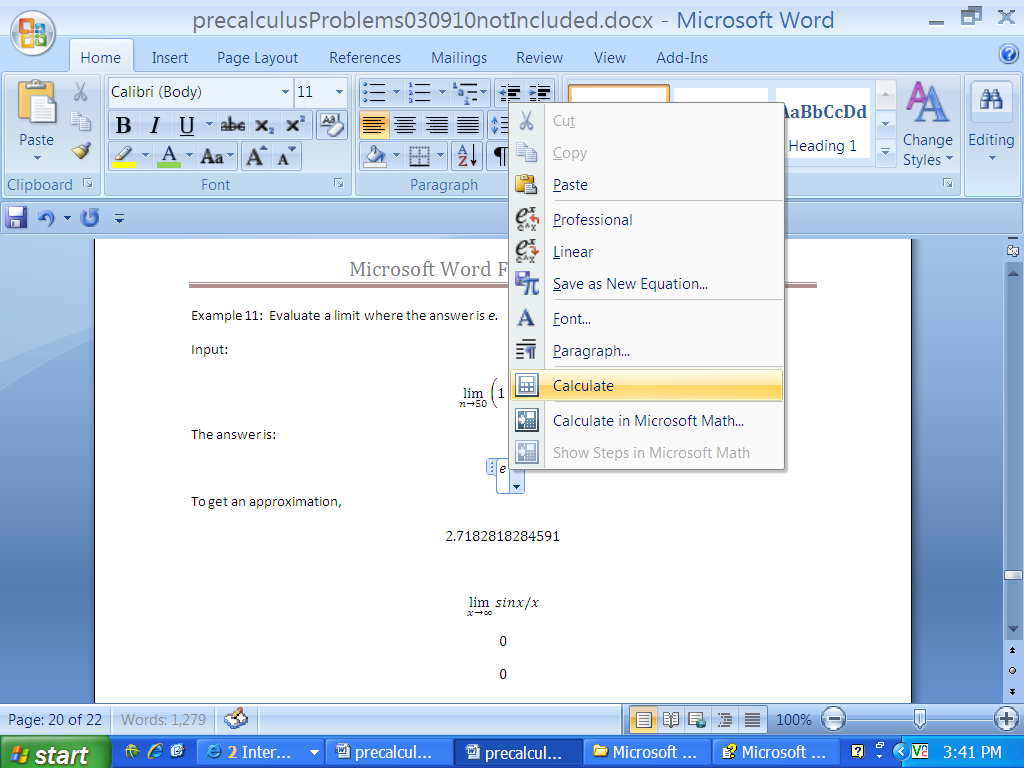
The output where is an integer is:

Example 11: Evaluate a limit where the answer is *e.*

Input:

The answer is:

To get an approximation, select *Calculate*.



Output:

Example 12: Evaluate a limit.

Input:

Output:

Example 13: Simplify an expression.

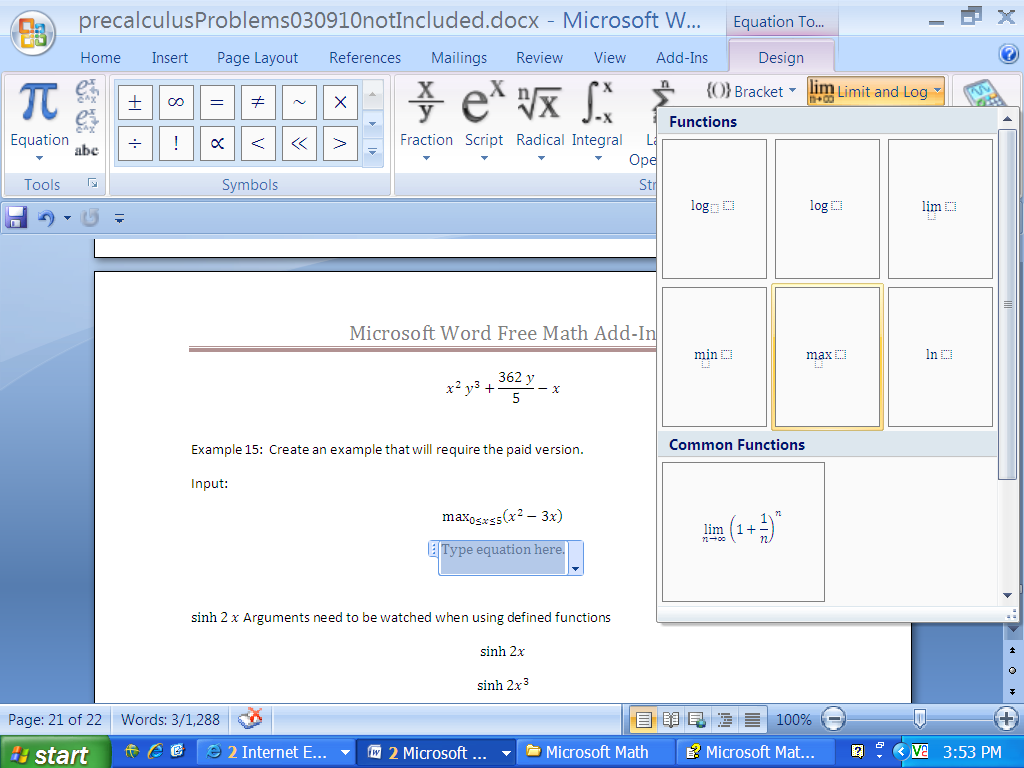
Input:

Output:

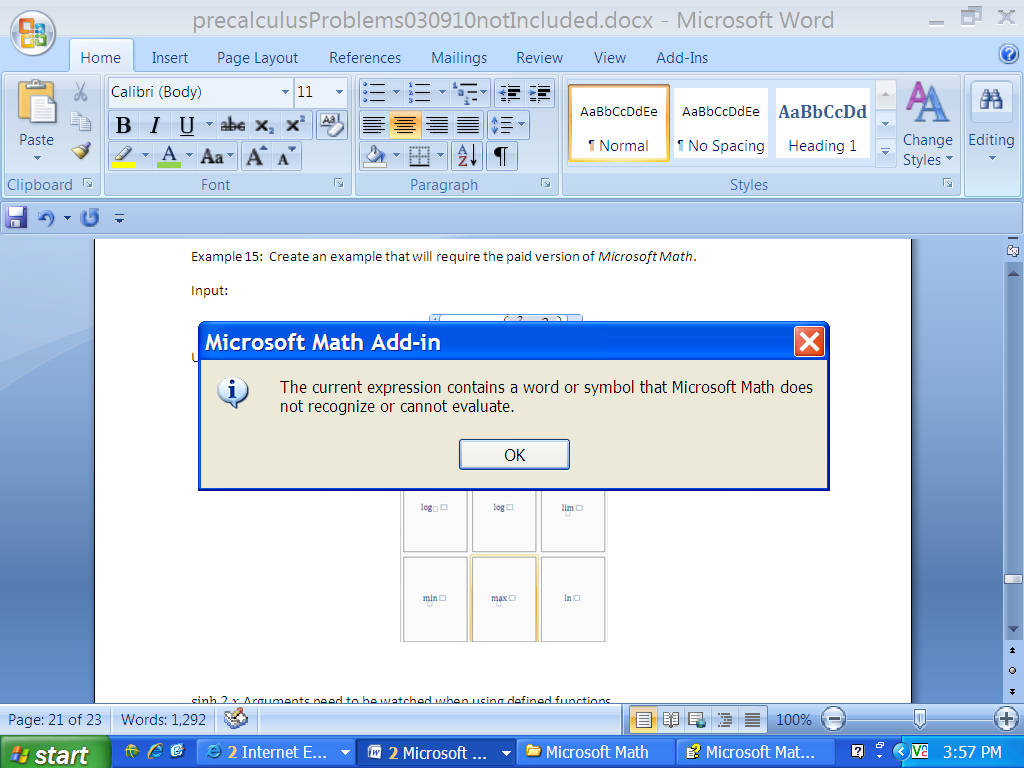
Example 14: Create an example that will require the paid version of *Microsoft Math*.

Input:

Use the function option.



Although it is possible to input the problem, the prompt will be:



Example 15: State the sequence of partial sums, S1, S2, S3, S4, and S5 for each of the two series below:

Note that the series uses *n* as the variable, and not *i.* If *i* were used, it would be understood as the irrational constant number, , and the line would not execute. For the first example, input:

Substitute *5* to get:

Select *Simplify* to yield:

The partial sums for our problem are:

Consider the original problem:

Select *Simplify* to get:

Select *Calculate* to have a decimal approximation:

Right-click and select *Calculate* for each output for a partial sum. The answers are:

Consider the input for the second example:

Substitute *5* to get:

Right-click and select *Simplify*. The output is:

Select *Calculate* to receive:

Similarly, substitute *1, 2, 3*, and *4,* also. The answer for the partial sums is:

Select *Calculate* for each output and the answer as a decimal for the partial sums is:

Consider the original problem:

Right-click and select *Simplify* to get:

The answer is not given. However, a substitution of a value for *n*

such as *n=60* gives the answer (with a little pause for the calculation) for the partial sum to be:

Select *Calculate* to get:

Example 16: Use the *nsolve* command to solve a system of equations involving trigonometric functions.

The syntax for the *nsolve* command is: *nsolve({eq1, eq2, ..,eqn}).* Consider the following equations:

There is an alternate way to solve this system. Insert each equation using a separate *Insert New Equation* prompt. Highlight both equations simultaneously using the left mouse to drag (and press) over both equations. Right-click and select *Solve for* . The answer is:

The executable line using *nsolve* is:

Select *Simplify* to yield:

Example 17: Solve the following system of polar equations by giving an approximate solution for .

Insert each polar equation individually using *Insert New Equation*. Left click and drag over both equations to highlight both equations simultaneously. Right-click and select *Plot in 2D*. Use the *Trace* feature to find the approximate solution for .

