

**Problem Solving in Physical Chemistry Introduction to Mathcad**  
**Part 2. Algebra with Mathcad: functions, Math menu (insert function )**

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edited for Mathcad 12 by

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Insert a text region containing your Name

**Save** this file to your personal storage device using a suitable file name.

a. Variables, functions, values. At the right **type** the following:

x:2  
3+7\*x-4\*e^x=  
f(x):3+7\*x-4\*e^x  
f(2)=

What is the value of f(-9)?

You must **learn to use the space bar** when entering functions.

Use them to **enter** the following function:

g(x):(7-x/9/x^2)+2/x/(x^2-1)

**What is the value** of g(2)? Did you get 2.03 as an answer. If not examine your function relative to the assigned function.

It is important to have any function you need written clearly before you start typing.

b. Mathcad knows many mathematical functions, e.g. the major trigonometric functions. You can find and insert functions with **f(x)** pull-down menu on the standard tool bar. The **f(x)** pull-down menu gives a variety of sets of functions for you to choose from.

$$h(\theta) := \frac{1 + \cos(\theta)}{(3 - \sin(\theta))^2}$$

For example, at right is the definition of  $h(\theta)$  created by two insertions from the function list and other elementary key-strokes.

Now, **define** the following function using the function menu and the Greek letter pallet:

$$g(\theta) := 7 * (1 - \tan(\theta) + \cos(\theta))$$

**What is the value** of  $g(0.5)$ ? Did you get 9.319?

Is it probably a good idea to learn the key strokes for some common Greek letters. On the right type D(ctrl+g). You should see a capitol delta.

Of course you can also type in the names of functions when you know them. You don't have to insert from the function pull-down menu unless you need to search for the correct usage of a new function.

c. The "error function" is defined by

$$\text{erf}(z) = \frac{2}{\sqrt{\pi}} \int_0^z e^{-u^2} du$$

You will find  $\text{erf}(z)$  in the **f(x)** menu too in the especial function collection. Use it to **find the values** of  $\text{erf}(0.1)$ ,  $\text{erf}(0.5)$ , and  $\text{erf}(10)$ .  
[Report the values to **7 significant figures**].

**Don't forget to save Save your worksheet on your storage medium.**

Here are some more exercises to practice with the Mathcad features described above. Work them, print them, and submit for grading if directed to do so by your instructor.

HELP  
Do you need help?  
Try Mathcad's help menu.

A. Define the following function:

$$PvdW(V, T) := \frac{R \cdot T}{V - b} - \frac{a}{V^2}$$

and use the values for R, a, and b that are appropriate for carbon dioxide. What is the pressure exerted by one mole of  $\text{CO}_2$  at 298K when the volume is 1 liter?  
[Report the answer in **atmospheres**].

$\text{CO}_2$ :  $a = 3.640 \text{ L}^2 \text{ atm}$ ,  $b = 0.04267 \text{ L}$ .  
 $R = 8.31451 \text{ L atm/K}$ .

B. Use the **f(x) menu** to choose functions to evaluate the following.

- (i)  $\log_e(700)$  and  $\log_{10}(700)$
- (ii)  $\sinh(1)$
- (ii)  $\text{Arctan}(\pi/3)$
- (iv)  $1-\text{erf}(0.5)$

Save your work.

Print the worksheet and submit for grading if directed to do so by your instructor.