CM3450
Fall 2008
Drill 6

1. Editing MathCad formulas 1.

First change the math format as follows:

a) Select **[Format]→[Equation…]** menu item
b) Choose **[Variables]**, click **[Modify…]** and change the font size to 12 and italic.
c) Choose **[Constants]**, click **[Modify…]** and change the font size to 12.
d) Click **[OK]**
e) Next, select **[Format]→[Style]** menu item
f) Choose **[Normal]**, click **[Modify…]** , click **[Font..]** and change font size to 12 pts
g) Click **[OK]**, click **[OK]** then click **[Close]**.

Now type the following text and equations in MathCad (note: use the **[ctrl =]** for the equality symbol) :

The other roots can then be obtained by using the values of the first root:

$$z_2 = \frac{-(A+z_1) + \sqrt{(A+z_1)^2 - 4\cdot\left[B + z_1\cdot(A+z_1)\right]}}{2}$$

$$z_3 = \frac{-(A+z_1) - \sqrt{(A+z_1)^2 - 4\cdot\left[B + z_1\cdot(A+z_1)\right]}}{2}$$

Case 2: $\Delta < 0$ There will be three real roots.

The first root will be obained as follows (whose proof is given below):

$$z_1 = \left[2\cdot\left(\sqrt{\frac{-p}{3}}\right)\right]\cdot\cos\left(\frac{atan\left(\frac{\sqrt{-\Delta}}{\frac{q}{2}}\right)}{3}\right) - \frac{A}{3}$$

Figure 1. MathCad Formulas.

2. Constants and Definitions.
   a) Open a new MathCad window and type the following definitions (this time use the colon symbol, **":"**):

$$R_g := 8.314 \frac{m^3 \cdot Pa}{mol \cdot K}$$

$$P := 1atm$$

$$T := (20 + 273.15)K$$

$$n := 100mol$$

$$V := \frac{n \cdot R_g \cdot T}{P}$$

Note: The squiggly lines are just warnings that these variables have been previously defined. For instance, V was previously used for "volts" and T was previously used for "Teslas". Also, note that we added a subscript g in R_g to avoid redefining R which was defined for Rankine.

   b) Now evaluate the volume V by typing "$V =$" using just the [=] key.

3. **Defining functions.**

Create a function that calculates the change in sensible heat for CO_2resulting from a temperature change from $T_{initial}$ to T_{final}.

$$\Delta H(n, T_{initial}, T_{final}) = n \int_{T_{initial}}^{T_{final}} C_p(T)\, dT$$

where n is the number of moles and the heat capacity is given by

$$C_{P,CO_2}(T \text{ in } °C) = (a_0 + a_1 T + a_2 T^2 + a_3 T^3) \frac{kJ}{mol \cdot K}$$

with the polynomial coefficients given by

$a_0 = 36.11 \times 10^{-3}$; $a_1 = 4.233 \times 10^{-5}$; $a_2 = -2.887 \times 10^{-8}$; $a_3 = 7.464 \times 10^{-12}$

Test with the following values : $n = 100$ moles, $T_{initial} = 30°C$ and $T_{final} = 90°C$

4. Do number 5 (page 21).