HW roots - BSE 3144

1. Write a 1/2 page cheatsheet on Roots, including how to identify and approach to solve.

2. A reversible reaction is the following:

2A + B ↔️ C

can be characterized by the equilibrium relationship

$$K = \frac{c_c}{c_a^2 c_b}$$

where c_i represents concentration. If we denote a variable x as representing the number of moles of C that are produced, the equilibrium equation becomes:

$$K = \frac{c_{c,0} + x}{(c_{a,0} - 2x)^2 (c_{b,0} - x)}$$

where 0 represents the initial concentration of each constituent. Assuming the following, find the value of x:

K = 0.016; $c_{a,0} = 41$*;* $c_{b,0} = 28$*;* $c_{c,0} = 4$

In your solution, enter the equation as a function using generic notation (e.g. similar to the first example in class on Monday, where g, t, and C_d were in the function).

3. Solve the roots problem using fzero to find all the roots between -1 and 3 for the following equation:

$$f = \sin(x^2) + x^2 - 2x - 0.09$$

4. Engineers use thermodynamics in their work. The following equation relates the zero-pressure specific heat of dry air c_p [kJ/(kg K)] to temperature [K]:

$$c_p = 0.99302 + 1.672 \times 10^{-4} T + 9.7216 \times 10^{-8} T^2 - 9.5837 \times 10^{-11} T^3 + 1.9320 \times 10^{-14} T^4$$

Make a plot of c_p versus temperature from T = 0 to 1200K. Then, find the temperature that corresponds to a c_p of 1.1 kJ/(kg K).