MTH 42 LECTURE NOTES (Ojakian)

Topic 4: Basic Applications

OUTLINE
(References: 1.4)

1. Various applications of solving a system of equations

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1. Traffic Flow

   PROBLEM 1. *Do Section 1.4, Example (p.38), but once in Echelon Form, solve using Anaconda.*

2. Balancing Chemical Equation

   PROBLEM 2. *Do Section 1.4, Example (p.42). But their caffeine molecule does not look right!?*

3. Planetary Orbits

   (a) Recall log rules:
      i. Multiplication - "becomes addition"
      ii. Exponention - "becomes multiplication"

   (b) Terminology:
      i. Select some (not all!) data that use used to **build** the model.
      ii. Use the other data to test how good the model is.

      PROBLEM 3. *Do Section 1.4, Example (p.40), solving with Anaconda at the end. Do as the text suggests and try with 3 planets.*

4. Polynomial Interpolation

   (a) Smallest degree polynomial passing through 2 points on the plane. Find it?

   (b) Smallest degree polynomial passing through 3 points on the plane. Find it?

   (c)

   PROBLEM 4. *Do section 1.4, exercise 25.*

   PROBLEM 5. *When will this approach* **not** *work for two points giving a line, where we use the form of the line:* $y = mx + b$.
   And more generally, what problems could we have for fitting more points?

5. Partial Fraction Decomposition

(a) Terminology:

i. Linear expression versus Quadratic expression

ii. Reducible versus Irreducible polynomial

(b) Recall some needed integrals

i. Using substitution

ii. Using natural log

iii. Using Arctan

(c) Recall the setup step

PROBLEM 6. *Section 1.4 (page 44): For each of excercises 19 to 22 note why the given equality makes sense.*
(can reference rules in Paul's Notes)

(d) Complete Problem

PROBLEM 7. *Solve the integral (use Anaconda for the system):*

$$\int \frac{x^2 - 29x + 5}{(x-4)^2(x^2+3)} dx$$