Math 10 Chp 9.1

Note Title 2017-02-10

Solving Systems of Linear Eqns by Substitution

Substitution is a major strategy in solving problems. It works for non-linear systems just as well. The idea is to reduce the number of variables and equations. Then substitute the values back to get the

Some substitutions make work easier (minimize fractions) but all should get the same answer.

Always substitute with brackets to avoid errors.

eg) $2x + 3y = 6$
$4x - y = 12$

A different way: $2x = 6 - 3y$

eg) $4x + 3y = 36$
$x - 2y = -13$

eg) $-3x + y = 13$
$2y + 3x = -1$

Enrichment:

eg) $x + 2y = -1$
$-2x - 4y - 3z = -7$
$3x + y + 2z = 8$

Assigned Work: pp. 474-479: 1, 2, 4, 6, 7, 9, 10

Challenge: 21-23

Math 10 Chp 9.2

Note Title 2017-02-10

Solving Systems of Linear Eqns by Elimination

Elimination can make solving easier because you avoid early dividing, thus avoiding possible fractions in intermediate calculations.

Note: computers and calculators use Gaussian Elimination to solve systems of linear eqns because it is faster for them than substitution.

eg) Solve by elimination.

Multiply one equation by a factor to make coefficients match with opposite sign.

$$2x - 3y = 16$$
$$5x + 6y = 13$$

eg) Solve by elimination

If you can't find a multiple, you can multiply by the corresponding coeff. to get opposite signs.

eg) $2x + y = 1$
$-2x + 3y = 11$

eg) $7x + 3y = 16$
$-6x + 5y = 9$

Enrichment: Larger linear systems are solved using matrices; we use the coefficients and leave out the variables. These are called augmented matrices.

$$\begin{aligned} x + 2y &= -1 \\ -2x - 4y - 3z &= -7 \\ 3x + y + 2z &= 8 \end{aligned} \Rightarrow$$

```
[A]
 [[1   2   0   -1]
  [-2  -4  -3  -7]
  [3   1   2   8 ]]
```

We plug this into a calculator and do a reduced row echelon form operation.

```
rref([A]
     [[1 0 0 1 ]
      [0 1 0 -1]
      [0 0 1 3 ]]
```

We can also use this on our previous example:

```
[B]
      [[7   3 16]
       [-6  5 9 ]]
rref([B]
       [[1 0 1]
        [0 1 3]]
```

Assigned Work: pp. 488-491: 1, 4-7, 9, 10, 12

Challenge: 15-17

Math 10 Chp 9.3

Note Title 2017-02-10

Solving Problems Using Systems of Linear Eqns
You have all the tools you need to do this, so let's just do more practice.... Need 2 variables and eqns

eg) Jenny's Grandma put $10,000 savings bonds for her in trust. Some of it was at 3% and the rest was at 3.5%. Over 16 years, the simple interest came to $5320. How much money was invested at each rate?

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eg) Phil wants to make pancakes with 2% milk, except he only has 1% and 3.25% milk. He needs 250 mL of 2%. How much of 1% and 3.25% milk does he need for his recipe?

eg) It takes 3 carpenters and 6 apprentices to frame a house in $40/9$ days. It takes 2 carpenters and 8 apprentices to frame the same house in $30/7$ days. What fraction of the house can a carpenter frame by himself in a day? and the apprentice?

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eg) Joey is four times older than Michelle. In 6 years, Joey will be only twice as old as Michelle. How old are each of them now?

Assigned Work: pg. 498-501: 3-8

Challenge: 12, 13