Chapter 4: Polynomial Equations and Inequalities

Skills and concepts you need: 1(a,c), 2(a,c), 3a, 5(b,d)

4.1 Solving Polynomial Equations

A **polynomial equation** is an equation in which one polynomial expression is set equal to another polynomial expression. In particular, the solutions to a polynomial equation $f(x) = 0$ are the zeros of the corresponding polynomial function $y = f(x)$.

- Class discussion: Ex1 + reflecting

There are, of course, more complex polynomial equations, and these can be solved using a variety of strategies which fall into one of two categories:

- Algebraically using a factoring strategy (would this work for ALL cases?)
    - Factor theorem method
    - Factor by grouping (ie. if there is a common factor between terms of a polynomial, most applicable to even degree polynomials).
- Graphically using a table of values, transformations, or graphing

Not all polynomials are factorable, so not all polynomial equations can be solved by factoring. In these cases, graphing must be used. Additionally, it may be necessary to ignore solutions outside of the domain defined by the conditions of the problem.

- Group discussion: Ex2, 3
- Group discussion: Ex 4-> need graphing software!

Individual/Partner: 1,2,3,4,5

Solving polynomial equations: https://www.youtube.com/watch?v=pd3Z0B3gmIU, https://www.youtube.com/watch?v=kLk8cUBe0Jg

Factoring by grouping: https://www.youtube.com/watch?v=ZaXaBcZxhq4 ***We do NOT factor using imaginary numbers.***

4.2 Solving Linear Inequalities

Review inequality symbols ($>, \geq, <, \leq$).

A **linear inequality** is when an inequality symbol is written between two or more linear expressions. You can solve the inequality by finding all possible variable values that satisfy the inequality, which can be done by using inverse operations.

A **number line** may help to visualize the solution set of an inequality. Number lines are similar to graphical representations.

- Ex. 

    - Arrows facing away imply the domain continues in that direction
    - Hollow circles imply the domain starts at a number but does not include that number
    - Solid or filled circles imply the domain starts at a number and includes that number.
- Class discussion: learn about the math, Ex 1
- Group discussion: A,B,C

Note that if you multiply or divide an inequality by a negative number, you must reverse the inequality sign (ie. $>\leftrightarrow<, \leq\leftrightarrow\geq$). Most linear equations have only 1 solution, but linear inequalities have many solutions.

- Group discussion: Ex 3,4

Individual/Partner: 1,2,3,4

Solving polynomial inequalities (linear and general polynomial inequalities) : https://www.youtube.com/watch?v=Fd5ys4PQ-aM

Assignment:

- Ch 4.1: 6(a,c,e), 7(a,c,e), 8(a,c,e), 10
- Ch 4.2: 5(a,c,e), 6(a,c), 7(a,c,e), 9, 12

4.3 Solving Polynomial Inequalities

Expanding from linear inequalities, we have also have **polynomial inequalities**, which are inequalities that contain a polynomial expression. To solve a polynomial inequality algebraically, first determine the roots of the corresponding polynomial equation. Consider the sign of the polynomial in the intervals between the roots and at the ends of the function. The solution is determined by the interval(s) that satisfy the given inequality.

- Class discussion: Ex 1
- Group discussion: reflecting A,B,C,D

As with polynomial equations, you can solve polynomial inequalities algebraically or graphically. Some polynomial inequalities will not be solvable algebraically, while all polynomial inequalities can be solved graphically.

Solving algebraically:

- Inverse operations to move all terms to one side of the inequality
- Factoring the polynomial to determine the zeros
- Using a number line, graph, or factor table to determine intervals on which the polynomial is +ve/-ve.

Solving graphically, there are 2 methods:

1) Leaving the inequality as is
    a) Graphing each side of the inequality as a separate function

b) Determining the intersection point(s) of the functions
c) Examining the graph to determine the intervals where one function is above/below the other, as required

2) Creating an equivalent inequality with zero on one side
   a) Once the inequality has been rewritten to have a zero on one side, identify the intervals created by the zeros of the graph of the new function
   b) Find where the new function is above or below the x axis, as required

- Group discussion: Ex 2, 3

Individual/partner: 1,2,3

Chapter test review:

Assignments, mid chapter review, chapter review, chapter self test