**Polynomial Functions and Inequalities: Unit Summary**

1. Polynomial Functions
	* are written in descending order of powers.
	* the degree of the polynomial is determined by the largest exponent on the dependent variable.
	* polynomial functions can have an upper or lower bound but not both.
	* they have no asymptotes.
	* The domain is $\{xϵR\}$
2. Finite differences can be used on a table of values to determine the degree of the polynomial function.
3. The end points of a polynomial function depend on the sign of the leading

 coefficient and the degree of the function.

* + For even degree functions --> relate to the parabola.
	+ For odd degree functions --> relate to the line.
1. Polynomial functions can have at most 'n - 1' turning points; if n is the degree.
2. Polynomial functions can have at most 'n' x-intercepts; an odd degree function will have at least one x-intercept whereas an even degree can have zero.
3. Although they are related, even/odd degree functions and are not necessarily the same as functions with even/odd symmetry; the terms degree and symmetry are defined separately.
4. The factored form of a polynomial function can be used to determine its x-intercepts. The exponent on each binomial factor relates to its presentation on the graph as an x-intercept (pg 145):
	* (x - d) --> the curve cuts through the x-axis at this x-intercept.
	* (x - d)2 --> the curve has a local max or min at this x-intercept
	* (x - d)3 --> the curve has a point of inflection at this x-intercept
5. Simple polynomial functions (such y = x3 or y = x4) can be graphed by using transformations (k, d, a, c) or a mapping function:

(x, y) ----------> 

1. Polynomials can be divided by using long division or the synthetic method; synthetic division can only be used when dividing by a linear binomial.
2. The remainder of dividing f(x) by (x - a) is f(a).
3. The binomial (x - a) is a factor of f(x) if the remainder is zero when it is evaluated at x = a.
4. Formulas exist to factor a sum/difference of cubes:

a3 + b3 = (a + b)(a2 - ab + b2)

a3 - b3 = (a - b)(a2 + ab + b2)

1. Polynomial equations can be solved by factoring or by using a graphing calculator.
2. Linear inequalities are solved by isolating for x; when both sides are multiplied or divided by a negative be sure to flip the direction of the inequality.
3. Polynomial inequalities are solved by factoring then either sketching a function or using a factors chart.
4. Rates of change are evaluated using traditional methods; the derivative may be used to verify your answer but is not to be used as your primary solution.

Practice

Complete Review Questions +

pg 184 # 1, 2, 3, 4ab, 5ab, 6, 8ac, 9d, 10abc, 11ab, 12c, 13, 14ac, 15ac, 16b, 17c, 18

pg 240 # 1ac, 2(algebraically only), 3, 5ab, 6ad, 7ac, 8a, 10ad, 11, 14ac, 15, 17c

Review Questions

1. State the end behaviors for the following

a) y = x3 + 2x2 + 6x + 2 b) y = -x6 + 2x3 - 5x + 1

2. Sketch a graph for the following; include all x-intercepts and the y-intercept.

a) y = -2(x+3)(x-2)(x-1) b) f(x) = -2x4 + 12x3 - 16x2 - 12x + 18

**y**

**x**

**y**

**x**

3. Determine the type of polynomial described in the following table of values using finite differences.

|  |  |
| --- | --- |
| x | Y |
| 4 | 80 |
| 6 | 15 |
| 8 | 0 |
| 10 | -1 |
| 12 | 0 |
| 14 | 15 |
| 16 | 80 |
| 18 | 255 |

4. Find the equation of the quartic function that has a turning point at the x-intercept 1, two other x-intercepts at 4 and

 6 and a y-intercept of -48.

5. Use long division to divide the following: (8x4 + 10x3 – 16x2 + 4x – 9) $÷$ (2x2 + 4x – 1).

6. Use synthetic division to evaluate the following: (x4 – 3x3 + 2x2 – x + 2) $÷$ (x – 5).

7. Determine the remainder: (x3 – 6x2 + 8x – 2) $÷$ (x - 3).

8. Factor.

a) 2x3 + x2 -22x + 24 b) 8x3 -125 c) 2x3 + 3x2 - 8x – 12

9. Solve the following inequality: 12x + 18 < 2x4 + 12x3 + 16x2

10. For the function f(x) = x3 - 3x2 – x + 3… a) Evaluate the rate of change over the interval $0\leq x\leq 2$. b) Evaluate the rate of change at x = -1 then verify your answer using the derivative.