Pre-Read Notes

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Contents

1 Chapter 1: Function Characts. and Props.

1.1 Functions

- A relationship is a function if a all values on the domain have less than or equal to 1 value on the range
- circular motion is represented by sinosoidal functions
- functions can be represented in many ways

1.2 Absolute value

- $f(x) = |x|$ describes values ≥ 0

1.3 Properties

- Each function has a unique mixture of elements, usually most visually apparent on a graph
- This can be used to distinguish them

1.4 Sketching Graphs

- Do transformations in steps
- Do translations last when listing transformations
- general formula: $y = af(k(x - d)) + c$

1.5 Inverse

- Inverse is done by swapping x and y variables
- graphically a reflection about x and y axis (along $y = x$)
- denoted by $f^{-1}(x)$
- not all inverses are functions

1.6 Piecewise

- A function with multiple rules
- Related to specific intervals in the domain
- filled circle for inclusive, empty circle for exclusive
- Does not have to be continuous

1.7 Operations within

- If functions have overlapping domains they can be combined
- By combining the dependant variable in some way
- Properties carry onwards

2 Chapter 3: Polynomial Functions

2.1 Polynomial Functions

- A polynomial arranged in this formula
- $a_nx^n + a_{n-1}x^{n-1} + \cdots + a_2x^2 + a_1x + a_0$
- where n are whole numbers and a are real numbers
- most simplified form
- the "degree" is the highest exponent in the polynomial
- degree is proportional to the number of "lines/curves" in the graph

2.2 Properties

- P. function's degree can indicate a lot:
- shape, turning points, zeroes, and end behavior
- odd degree $\rightarrow$ opposite end dir., even degree $\rightarrow$ same end dir.
- if even
- if leading coefficient is pos $\rightarrow$ goes positive to negative
- if leading coefficient is neg $\rightarrow$ goes negative to positive

- if odd
- neg $\rightarrow$ face negative, pos $\rightarrow$ face positive
- turning points proportional to n - 1
- y axis symmetrical $\rightarrow$ even function, rotational symetry $\rightarrow$ odd function

2.3 Factored Form

- Polynomial function family $\rightarrow$ P. functions of similar properties
- zeroes of a P. function are same as roots of related P equation (when factored?)
- Factored form gives roots, factored form at 0 gives zeroes
- Use zeroes and a point to get equation from $f(x) = a(x-b)(x-b)\cdots$ where a is solved using the extra point and b, c, $\cdots$ are zeroes
- if root is exponent 1 $\rightarrow$ passes through as if linear
- if root is exponent 2 $\rightarrow$ glances off like quad vertex
- if root is exponent 3 $\rightarrow$ passes flat before going through, like parent root function

2.4 Transformations

- Like any other function

2.5 Dividing

- Polynomials can be divided in similar manner to numbers
- Like with long division
- remainders are added to the end of the equation, rest becomes factors

2.6 Factoring

- Remainder theorum: $\frac{f(x)}{x-1} = f(a)$
- Factor theorum: x - a is a factor if $f(a) = 0$
- To factor:
  1. use factor theorum to determine factor
  2. divide by factor

2.7 Factoring Sum or Difference

- Expressions with two perfect cubes
- $A^3 + B^3 = (A + B)(A^2 - AB + B^2)$
- $A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

3 Chapter 4: Polynomial Equ. and Ineq.

3.1 Solving

- Solutios of f(x) = 0 are zeroes
- sometimes you need to ignore the values outside of the defined intervals

3.2 Solving Linear Inequalities

- Solve linear inequalities by rearranging, like solving linear equations
- If you multiply or divide by a negative number, flip over the inequality sign

3.3 Solving Polynomial Inequalities

- To solve:
  1. Solve for main points, like roots
  2. Plot on some sort of line system
  3. This will give you your solution ranges

3.4 Rates of Change in Polynomials

- Rate of change is $\frac{change\ in\ range}{change\ in\ domain}$
- On interval $x_1 \leq x \leq x_2$ is $\frac{f(x_2)-f(x_1)}{x_2-x_1}$
- When x is very small, $roc = \frac{f(x+h)-f(x)}{h}$
- On any "indexes" the roc is near 0

4 Chapter 5: Rational funcs., eqs., ineqs.

4.1 Graph of Reciprocals

- Reciprocals of linear and quadratic functions follow a similar general graphed form
- Take characteristics from original to graph Reciprocals
- Y coordinates mostly the same to the original
- original's zeroes determine vertical asymtotes
- Reciprocals always start with a asymtote on $y = 0$ unless translated

4.2 Quotients of Polynomials

- Rational function is $f(x) = \frac{g)x()}{h(x)}$ where $f(x)$ and $g(x)$ are Polynomials
- Has breaks or gaps where denominator is zero, must be restricted
- vertical asymtotes and gaps determine restrictions on the domain
- end behavior determined by vertical or oblique asymtotes
- oblique asymtote: slanted asymtote
- Horizontal asymtote $\rightarrow g(x)$ degree is less than or equal to $h(x)$
- Otherwise, if greater, slanted asymtote

4.3 graph in form $\frac{ax+b}{cx+d}$

- Most have vertical and horizontal asymtotes
- Determine vertical asymtote by finding what creates 0 on the denominator
- Determine horizontal asymtote by comparing the ratio between numerator and denominator leading coefficient
- in form $\frac{b}{cx+d}$ vetical asymtote at $x = -\frac{d}{c}$ and horizontal asymtote at $y = 0$
- If numerator and denominator have a common linear factor, line has hole where the zero of the common factor occurs

4.4 Solving Rational Equations

- Solve algebraicly
- zeroes in rational function are zeroes of the numerator
- Make sure to check for extraneous answers

4.5 Solving Rational Inequalities

- Find all values that satisfy inequality
- Use roots and an inequality table

4.6 Rates of Change

- Use previous methods to calculate rates of change
- Cannot calculate where there is a hole
- roc at vertical gaps or asymtotes are undefined
- roc $\rightarrow$ horizontal asymtotes approach zero

5 Chapter 6

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6 Chapter 7

7 Chapter 8

8 Chapter 9

9 Chapter 2