

5th precalc ACC
 Chapter 4 summary sheet

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- 4-6
- 1) what is the polynomial (based on zeros)?
 - 2) are there any squares on any of the binomials factors (based on non-alternating signs)?
 - 3) is the inequality $>$, \leq , $>$, \geq , or $=$ (solution coefficient sign pattern)?
 - 4) what is the sign of the leading coefficient?

4-1 Review of Linear Functions

Linear functions (degree = 1) as lines: slopes & intercepts

Form of linear equations:

→ slope intercept - $y = mx + b$

→ point-slope - $y - y_1 = m(x - x_1)$

→ standard - $Ax + By = C$

→ intercept - $x/b + y/b = 1$

Slope rules:

→ $m = \frac{y_2 - y_1}{x_2 - x_1}$ → $m = -\frac{A}{B}$

• a = the x-intercept

• b = the y-intercept

• m = slope

• parallel lines have the same slope

• perpendicular lines have negative reciprocal slopes

• function notation - $f(x) = y$

vocab:

→ y-intercept - the point where $x = 0$

→ zero (x-intercept) - the point where $y = 0$

2 kinds of equations:

1) find the equation

2) find the traits of a line, slope, or intercept

key ideas

1) don't miss the easy points

4-2 Review of quadratic equations

Quadratics (degree = 2) graph as parabolas

3 forms for the equation of a quadratic:

1) $y = ax^2 + bx + c$

2) $y = a(x - h)^2 + k$

3) $(x - h)^2 = 4p(y - k)$

traits

• vertex = (h, k)

• direction that it opens (up or down) = based on sign

• zeros

3 kinds of equations:

1) Find zeros → factoring, quadratic formula

2) Find the vertex → completing the square

3) Find equation; give traits

key ideas

1) don't confuse the processes

2) give the traits as which they are (zeros = coordinates, vertex = coordinate w/ the opposite sign of the parentheses)

4-3 Finding complete graphs of polynomials

vocab:

- degree - the highest point of x
- zeros (x-intercepts) - the points where the curve crosses the x -axis
- extreme points - high & low points on the curve
- critical value - x -value on the extreme point
- extreme value - y -value on the extreme point
- maximum value - y -coordinate on the high point
- minimum value - y -coordinate on the low point
- relative vs. absolute extreme values - relative refers to crests & troughs of the curve; absolute refers to highest and lowest y -values for the range

Shapes:

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Key ideas

- 1) you can't just trust your calculator
- 2) the degree of the problem tells you the shape of the graph
- 3) to find the traits, you might need to use different windows
- 4) the degree also tells you the number of zeros you will probably have (or maximum and the number of extremes (degree-1))

4-5: Finding zeros of higher degree polynomials

ways to find zeros w/ higher degree functions:

- 1) by calculator
- 2) by grouping (similar to splitting the middle term w/ middle term to split)
- 3) factoring quadratic (guess & check, split the middle term)
- 4) synthetic substitution - ex) Prove 3 is a zero for $x^3 - 4x^2 - 3x + 18$

$$\begin{array}{r|rrrr} 3 & 1 & -4 & -3 & 18 \\ & & 3 & -12 & 27 \\ \hline & 1 & -1 & -15 & 45 \end{array}$$

→ it is a zero

$$x^2 - x - 18 = (x-3)(x+6)$$

Finding equations from traits: ex) find a function w/ zeros (3,0), (1,0), (-1,0) which contains (0,6) $y = a(x-3)(x-1)(x+1) \rightarrow y = x^3 - 3x^2 - x + 3$
 $6 = a(0-3)(0-1)(0+1) \rightarrow a = 2 \quad y = 2(x-3)(x+1)(x+1)$

Key ideas

- 1) synthetic division does 2 things: it proves whether your guess is a zero or not and if factors your problem is your guess is a zero
- 2) your guess comes from your calculator
- 3) if there is a missing term in your function, you need to put a 0 in your synthetic division (placeholder)

4-6: Sign patterns

sign pattern - an organized way of listing all the zeros and the signs of the y values of a function; they can be organized in a number line.

- Process of creating a sign pattern:
- 1) factor the polynomial + find zeros
 - 2) put zeros on number line (and label)
 - 3) determine sign of the right end sign pattern
 - 4) moving to the left, alternate sign patterns as you cross a zero unless it's a bounce.
- 2 ways to determine the signs:
- 1) plug in any x -value into the polynomial to determine sign on the right of the sign pattern
 - 2) the coefficient of the degree determines the sign on the right of the sign pattern.

Key ideas

you have to label the sign pattern

numbers on a number line go in order

the coefficient of the degree tells us the sign on the right.

the sign will change when you cross a zero unless it's a bounce

Interval notation:

- closed interval = $x \in [a, b]$ means $a \leq x \leq b$
- open interval = $x \in (a, b)$ means $a < x < b$
- half open interval = $x \in [a, b)$ means $a \leq x < b$

* questions to ask when reversing sign pattern process for finding an