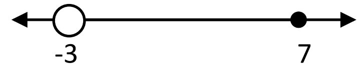
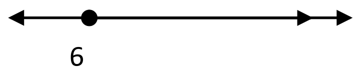
ALGEBRA 2 STUDY GUIDE

Ch 1 FOUNDATIONS

Interval Notation (-3, 7]



Set Builder Notation $\{x \mid x \geq 6\}$



Domain "x" input values

Range "y" or f(x) output values

All (h, k) shifts
- a = vertical stretch
- h = horizontal shift
- k = vertical shift

Parent Functions:
- A) Linear $f(x) = x$
- B) Quadratic $f(x) = x^2$
- C) Cubic $f(x) = x^3$
- D) Square Root $f(x) = \sqrt{x}$
- E) Exponential $f(x) = ab^x$
- F) Logarithmic $f(x) = \log x$ or $f(x) = \ln x$
- G) Absolute Value $f(x) = | x |$

Ch 2 LINEAR FUNCTIONS

Slope – Intercept Form $y = mx + b$

Point-Slope Form $y - y_1 = m(x - x_1)$

Slope $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Vertical Line $x = a$ Horizontal Line $y = b$

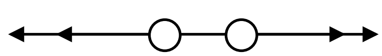
Parallel Lines have = slopes

Perpendicular Lines have "opposite reciprocal" slopes

Linear Inequalities
- $<$ shade below $\leq$ shade below/include line(solid line)
- $>$ shade above $\geq$ shade above/include line(solid line)

Absolute Value

Or is a disjunction



And is a conjunction

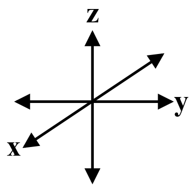
Solving → 2 equations, 1 positive, 1 negative

Ch 3 LINEAR SYSTEMS

Methods of solving
1) Graph ~ solution is point of intersection
2) Substitution
3) Elimination

Inequality Solution is the double shaded region

3-D Graphing
Graphing a point (x, y, z)
Graphing a plane by graphing the intercepts



Linear Programming → Maximums/Minimums occur at vertices

Ch 5 QUADRATIC FUNCTIONS

Standard Form $f(x) = ax^2 + bx + c$
- a = direction & width
- b → $\frac{-b}{2a}$ axis of symmetry
- c = y-intercept

Vertex Form $f(x) = a(x - h)^2 + k$ Vertex = (h, k)

Solving Quadratics
A) Factor
B) Graph (x-intercepts)
C) Complete the square
D) Quadratic Formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Discriminant $b^2 - 4ac$
- – No Real Solutions
- 0 1 Real Solutions
- \+ 2 Real Solutions

Complex Numbers a + bi
Add, subtract, multiply, divide, graph, find absolute value
$i^2 = -1$ $i = \sqrt{-1}$

Ch 6 POLYNOMIAL FUNCTIONS

Add, subtract (like terms)

Multiply (FOIL, Area boxes, distribute)
Binomials → use Pascal's Triangle

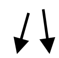
Divide
Long Division, Synthetic Division, $\frac{4}{a+3i} \cdot \left(\frac{a-3i}{a-3i}\right)$ use conjugate

Ch 6 POLYNOMIAL FUNCTIONS CONTINUED

Solving

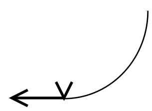
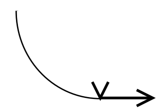
- Factoring
  - 4 terms → try grouping
  - +/- of cubes $a^3 + 2^3 = (a + 2)(a^2 - 2a + 4)$
- Graphing, solutions (zeros) are x-intercepts
- Irrational answers come in pairs
- Complex answers come in pairs
- Exactly n roots x^5 has 5 roots

End Behaviors

Even +    Even – 

odd +    Odd – 

Ch 7 EXPONENTIALS/LOGARITHMS

Exponential $f(x) = ab^x$ $b > 1$ growth  $b < 1$ decay 

Finding Inverse Functions

Switch x and y, then solve for y

Logarithms

$3^2 = 9$ → $\log_3 9 = 2$

$\log_4 64 = 3$ → $4^3 = 64$

Properties

Product	$\log_b mn = \log_b m + \log_b n$
Quotient	$\log_b \frac{m}{n} = \log_b m - \log_b n$
Power	$\log_b a^p = p(\log_b a)$
Change of base	$\log_b a = \dfrac{\log a}{\log b}$ base 10 now

Solving Exponentials → use logs

Solving logs → use exponents

"e" = 2.718

Ln e = 1

Natural Logs $y = \ln x$

Continuous Compounding $A = Pe^{rt}$

Ch 8 RATIONAL FUNCTIONS

Direct Variation	$y = Kx$,	$K = \frac{y}{x}$	Linear line through (0, 0)
Inverse Variation	$y = \frac{K}{x}$,	$K = xy$	Hyperbola

Factoring helps with simplifying, multiplying, dividing

Add/Subtract → need a LCD

Discontinuous graphs, holes, asymptotes, breaks

$$f(x) = \frac{p(x)}{q(x)}$$

Zeros in Numerator
Vertical Asymptotes in denominator
Holes are same factors

Degrees	Horizontal asymptote
p > q	none
p < q	y = 0
p = q	divide coefficients

Solving → Multiply by LCD

Radicals are Fractional exponents $49^{1/2} = \sqrt{49}$ $\sqrt[3]{a^2} = a^{2/3}$

Radical Functions $y = \sqrt{x}$ sideways parabolas

Solving radical equations, isolate the radical, then do inverses

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Ch 9 FUNCTIONS

$f(x) = 3x$ $g(x) = 2x^2 - 1$

f(2) =	(f + g)(x) =	(f – g)(x)=
f(g(4)) =	f(g(x)) =	g(f(x)) =

Ch 10 CONICS

Circles $(x - h)^2 + (y - k)^2 = r^2$ center (h, k)

Ellipses $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ Horizontal → a is always > b

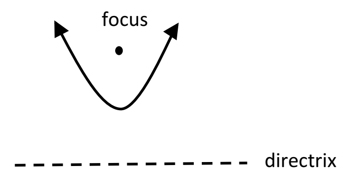
Major axis, minor axis, foci ($a^2 - b^2 = c^2$), vertices, co-vertices

Hyperbolas $\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1$ Horizontal because x comes 1st

Transverse axis, conjugate axis, vertices, co-vertices, foci ($a^2 + b^2 = c^2$), asymptotes, central rectangle

Ch 10 CONICS CONTINUED

Parabolas $a = \frac{1}{4p}$



$y - k = \frac{1}{4p}(x-h)^2$ vertical

$x - h = \frac{1}{4p}(y-k)^2$ horizontal

To change to standard form you complete the square(s)

Ch 11 PROBABILITY

Factorial $4! = 4\cdot3\cdot2\cdot1$

Permutation (order) $_nP_r = \frac{n!}{(n-r)!}$

Combination (no order) $_nC_r = \frac{n!}{r!(n-r)!}$

Counting Principle: If you have m choices and then n choices then you have m·n total choices

All probabilities are between 0 and 1

Theoretical = $\frac{favorable\ outcomes}{total\ outcomes}$ what <u>should</u> happen

Experimental = $\frac{\#\,of\ times\ event\ occurred}{\#\,of\ trials}$ what <u>did</u> happen

P(A <u>and</u> B)
- Independent → P(A)·P(B) Dependent → P(A)·P(B|A)

P(A <u>or</u> B)
- Exclusive → P(A) + P(B) Inclusive → P(A) + P(B) – P(Both)

Central Tendency
- Mean, Median, Mode
- Variance is the mean of the differences squared i.e. $(x-\bar{x})^2$
- Standard Deviation is $\sqrt{variance}$

Binomial Theorem/Probability
- Pattern 1 $_nC_r$ or Pascal's Triangle
- Pattern 2 1st term descends

Pattern 3 2^{nd} term ascends

$$P(r) = {}_nC_r \cdot p^r q^{n-r}$$

Ch 12 SEQUENCES & SERIES

Arithmetic "d"

Sequence $a_n = a_1 + d(n-1)$

Series $S_n = \frac{n}{2}(a_1 + a_n)$

Geometric "r"

Sequence $a_n = a_1 \cdot r^{n-1}$

Series $S_n = a_1\left(\frac{1-r^n}{1-r}\right)$

Geometric mean $\sqrt{ab}$

Infinite converge $\frac{a}{1-r}$