

MATH 141: PRECALCULUS

QUIZ 1A AND QUIZ 1B: LOGIC, ALGEBRA, AND FUNCTIONS (PRELIMINARIES, CHAPTER 1)

DISCLAIMER: This may or may not be a comprehensive list, but it's a very good start!
Know all aspects of these topics; I may go beyond listed subtopics.

PRELIMINARIES: LOGIC AND BASIC ALGEBRA

Logic

If-then vs. If-and-only-if
Set Notation: \forall , \exists , \in
Converse, Inverse, Contrapositive
Necessary and / or Sufficient Conditions

Rounding (Topic 1)

Absolute Value (Topic 2)

Piecewise Definition
Properties
Absolute Value and Distance

Fractional, Radical, and Exponential Forms (Topic 3)

Converting
Domain
Rules of Exponents and Simplifying

Polynomials and Factoring (Topic 4)

Standard Form for Polynomials
Know all basic factoring techniques, including grouping. (See [worksheet.](#))
Test for Factorability
Factor out GCF and / or -1 early on
Don't forget the Sum and Difference of Two Cubes!

Rational and Algebraic Expressions (Topic 5)

Factoring with Weird (Negative and/or Fractional) Exponents; Quadratic Forms (Topic 6)

Simplifying Algebraic Expressions (Topic 7)

Divide ("cancel") common factors to simplify;
Also, the "Switch Rule" for, say, $a - b$ and $b - a$
Rationalizing numerators, denominators

Common Errors (Topic 8)

More Algebra Tricks (Topic 9)

Splitting through Numerators
Making Complex (or Compound) Fractions
Compensation

CHAPTER 1: FUNCTIONS AND THEIR GRAPHS

Cartesian / Rectangular Plane (1.1)

Distance Formula

Midpoints

Basic Principle of Graphing and Circles (1.2)

Standard Form for equations

Various problems; see homework

Related Geometric Formulas

Graphs of Lines (1.3)

Slope: Formula, $\frac{\text{rise}}{\text{run}}$, and Interpretation

Equation Forms

Point-Slope Form

Slope-Intercept Form

Intercept Form

Special Cases: Horizontal and Vertical Lines, including Coordinate Axes

Given two points, find an equation of the connecting line

Parallel and Perpendicular Lines

Finding Intercepts (for all graphs)

• THE FOLLOWING IS QUIZ 1B MATERIAL.

Functions (1.4)

Using f Notation

Domain and Range

Expressing them using Graphs, Interval Form, and Set-Builder Form

Piecewise-Defined Functions

Greatest Integer (or Floor) Function

Difference Quotients: Evaluating and Simplifying

Analyzing Graphs of Functions (1.5)

Point-Plotting as a last resort

Vertical Line Test (VLT): applying it

Graphs and Domain and Range

Zeros (or "Roots") of a Function

Real Zeros as x -Intercepts

Zeros when Radicals and / or Fractions are involved

Watch the Domain!

Zero Factor Property (ZFP) and Quadratic Formula (QF)

Remember to isolate 0 on one side!

Test for Factorability

Completing the Square (CTS) can be an alternative to the QF.

Where is f Increasing vs. Decreasing vs. Constant?

Functions that are Even / Odd / Neither and Symmetry

Graphing Piecewise-Defined Functions

Symmetry and Equations

Difference Quotients and Average Rates of Change

Derivatives (not on Midterm, but good to know for Calculus)

A Library of Parent Functions (1.6)

Basic Functions and Their Graphs

Asymptotes

Symmetry

Transformations (1.7)

Translations: Vertical and Horizontal Shifts

Reflections: About x -axis, y -axis

Nonrigid: Stretching and Squeezing

Combining Transformations

Combinations of Functions (1.8)

$f + g$, $f - g$, fg , $\frac{f}{g}$

Compositions of Functions

Decomposing a Composite Function

Domains for the above

Inverse Functions (1.9)

One-to-One (“1-1”) Functions and the Horizontal Line Test (HLT)

Tables and Graphs of f vs. f^{-1}

Switching x (Domain), y (Range)

Finding $f^{-1}(x)$

Variation: Direct, Inverse, and Joint (1.10)

Models and Constants of Proportionality / Variation