Math 4 Pre-Calculus
Lecture 3, Part 2

Homework:
pg. 132,133: 23–51 odd, 53-97eoo
pg. 138,139: 37–61 eoo, 71, 73, 75
pg. 316: 7–21 odd
pg. 373, 374: 3–39 odd

Inequalities — 1.5, 1.6, 4.5, 5.4

Inequalities and Notation

English	Graph	Set Notation	Interval Notation
a number is less than 2		$\{x \mid x < 2\}$	$(-\infty , 2)$
a number is less than or equal to 2		$\{x \mid x \le 2\}$	$(-\infty , 2]$
a number is greater than 2		$\{x \mid x > 2\}$	$(2 , \infty)$
a number is greater than or equal to 2		$\{x \mid x \ge 2\}$	$[2 , \infty)$
a number is between but not equal to 2 and 5		$\{x \mid 2 < x < 5\}$	$(2 , 5)$
a number is greater than or equal to 2 ***and*** *is less than or equal to 5*		$\{x \mid x \ge 2 \text{ and } x \le 5\}$ or simplified: $\{x \mid 2 \le x \le 5\}$	$[2 , \infty) \cap (-\infty , 5]$ or simplified $[2 , 5]$
a number is less than 2 ***or*** *is greater than or equal to 5*		$\{x \mid x < 2 \text{ or } x \ge 5\}$	$(-\infty , 2) \cup [5 , \infty)$
a number is greater than 2 ***or*** *is less than 5*		$\{x \mid x > 2 \text{ or } x < 5\}$ or simplified $\{x \mid x \in \mathbb{R}\}$	$(2 , \infty) \cup (-\infty , 5)$ or simplified $(-\infty , \infty)$
a number is less than 2 ***and*** *is greater than 5*		$\{x \mid x < 2 \text{ and } x > 5\}$ or simplified $\varnothing$	

Linear Inequalities

To solve, treat exactly like a linear equation, **except** when multiplying or dividing by a negative number, remember to also switch the inequality sign.

Solve.

1. $-\frac{1}{6}x + 7 \le \frac{1}{3}x - 2$

2. $-5 < \frac{6-5x}{3} < 2$

3. $(x-3)(x+3) \geq (x+5)^2$

Absolute Value Inequalities

To solve, isolate the absolute value, then rewrite with one of these appropriate compound inequalities:

- If $|a| < b$ then $-b < a < b$
- If $|a| > b$ then $a > b$ or $a < -b$

Solve.

4. $|x| < 5$

5. $|x| \geq 5$

6. $2|-11-7x|-2>10$

7. $2 \leq |2x-1| \leq 5$

Rational and Polynomial Inequalities

To solve:

- **Get a zero** on one side of the inequality by adding or subtracting.
- **Factor** the denominator (and numerator).
- **Find the zeros** of each factor.
- Split the real number line into intervals that correspond to the zeros of each factor.
- **"Test" the sign of each factor** over these intervals.
- Determine the sign of the quotient (or product) in each interval.
- Write the answer in interval notation.

Do **not** multiply or divide by an expression with a variable! The zeros of the factors in the denominator are never part of the solution. Pay attention to the "strictness" of the inequality sign.

Determine the sign of the following factor over the entire real number line.

8. $x-2$

Solve.

9. $x-2<0$

10. $x+3<0$

11. $(x-2)(x+3)<0$

12. $x^2-4x-17\le 4$

13. $x^4+15x^2>16$

14. $\dfrac{3}{x-2}<0$

15. $\dfrac{5}{3-x} \geq 0$

16. $\dfrac{-7}{(x+1)^2} \leq 0$

17. $\dfrac{x+1}{x^2-9} \leq 0$

18. $\dfrac{x}{2x-1} \leq \dfrac{3}{x+2}$

19. $\dfrac{(x+3)^2(2-x)}{(x+4)(x^2-4)} \leq 0$