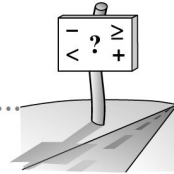$4.3.1$ What's your sign?

Polynomial and Rational Inequalities

#102 A NEW TYPE OF NOTATION

Examples: **inequality notation**   **interval notation**

inequality notation	interval notation
$x > -7$	$(-7, \infty)$
$x \le 21$	$(-\infty, 21]$
$-7 < x \le 21$	$(-7, 21]$
$x < -7$ or $x \ge 21$	$(-\infty, -7) \cup [21, \infty)$

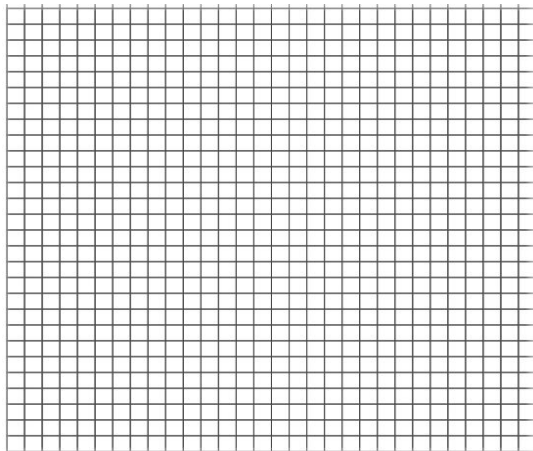|	
a. Express $x \ge 35$ in interval notation.	b. Express [–3, 18) in inequality notation.
c. Express $14 \le x < 52$ in interval notation.	d. Express $(-\infty, 6] \cup (97, \infty)$ in inequality notation.

e. Express $x \ne 0$ using interval notation.

#104 A portion of road that meanders through a countryside can be modeled by the equation $g(x) = 0.00005(x - 5)(x - 15)(x - 22)^2(x - 30)$ where $5 \le x \le 30$ and $y = 0$ divides North County and South County.

a. To determine which sections of the road are in North County, solve the inequality $0 < 0.00005(x - 5)(x - 15)(x - 22)^2(x - 30)$ graphically.	b. Now, work with your team to solve $0 < 0.00005(x - 5)(x - 15)(x - 22)^2(x - 30)$ algebraically. Be prepared to share your strategies with the class.

105 While working on the previous problem, Dakota had an idea! He grew tired of doing so many calculations, so he drew a diagram. With your team, analyze Dakota's diagram. What is he thinking? How is he avoiding making lots of calculations?

Complete Dakota's diagram.

		5	15	22	30
$(x - 5)$	–	+	+	+	+
$(x - 15)$	–				
$(x - 22)^2$	+				
$(x - 30)$	–				
$g(x)$	–				

106. Callie thinks Dakota's method is wonderful, so she decides to use it to solve $2x^3 - 3x^2 - 11x + 6 \le 6$. Her work is shown below. Analyze her work. Is it correct? If it is correct, help Callie finish the problem. If it is not correct, identify her mistake.

$2x^3 - 3x^2 - 11x + 6 \le 6$
$(x + 2)(2x^2 - 7x + 3) \le 6$
$(x + 2)(2x - 1)(x - 3) \le 6$

		-2	$\frac{1}{2}$	3
$(x + 2)$	–			
$(2x - 1)$	–			
$(x - 3)$	–			
$(x + 2)(2x - 1)(x - 3)$	–			

#107 Recall that rational functions are ratios of polynomial functions. Can you use the techniques you have learned in this lesson to solve the following rational inequalities? Work with your team to solve each of the rational inequalities below. Be prepared to share your strategies with the class.

a. $\dfrac{x-1}{x^2+5x-36} > 0$

b. $\dfrac{8x-x^2}{x-6} \le 0$

c. $\dfrac{x-3}{x-6} - 5 \ge 0$

d. $\dfrac{4x-9}{x-7} < 3$