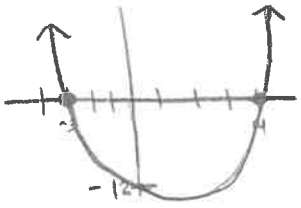
Do I need to graph $f(x) = x^2 - x - 12$ to know when the function is below the x-axis (negative), or above the x-axis (positive)?

$f(x) = (x-4)(x+3)$

$0 = (x-4)(x+3)$

$x = -3, 4$



function <0 $(-3, 4)$

function >0 $(-\infty, -3) \cup (4, \infty)$

How could I have found w/o graphing?

* places it changes sign are zeros
* critical points*

then determine if + or - around those zero's

Solving a Quadratic Inequality

Step 1: Solve the corresponding quadratic equation

Step 2: Identify the intervals determined by the solutions of the equation

Step 3: Use a test value from each interval to determine which intervals form the solution set

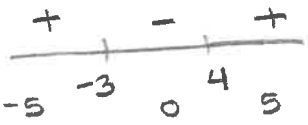
1. Solve the following:

   a. $x^2 - x - 12 < 0$

$(x-4)(x+3) < 0$

$x = 4, -3$

zeros are where changes sign



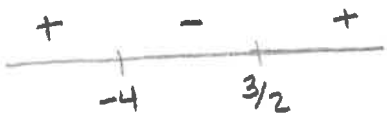
* not equal to zero so parenthesis

$(-3, 4)$

   b. $2x^2 + 5x - 12 \geq 0$

$(2x-3)(x+4) \geq 0$

$x = 3/2, -4$



$(-\infty, -4] \cup [3/2, \infty)$

2. If a projectile is launched from ground level with an initial velocity of 96 ft per sec, its height s in feet t seconds after launching is given by the following equation, $s = -16t^2 + 96t$. When will the projectile be greater than 80 ft above ground level?

$80 < -16t^2 + 96t$

$5 < -t^2 + 6t$

$t^2 - 6t + 5 < 0$

$(t-5)(t-1) < 0$

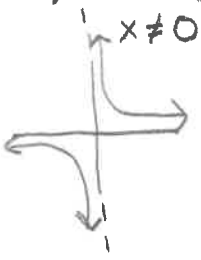
$t = 5, 1$

$t \in (1, 5)$

Solving a Rational Inequality

different from polynomials b/c can change from above to below x-axis (vice versa) w/ vertical asymptotes

ex) $f(x) = \frac{1}{x}$



Step 1: Rewrite the inequality, if necessary, so that 0 is on one side and there is a single fraction on the other side.

Step 2: Determine the values that will cause either the numerator or the denominator to equal 0.

*These are the values to consider on the number line

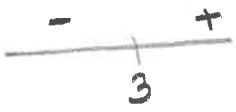
Step 3: Use a test value from each interval to determine which intervals form the solution set.

Caution:

- a value causing a denominator to equal zero is not in the solution
- A value causing the numerator to equal zero will be included in the solution if the inequality is "equal to"

3. Solve the following:
   a. $\frac{2}{x-3} \geq 0$

$x \neq 3$



$(3, \infty)$

doesn't include 3 b/c 3 makes den = 0

b. $\frac{5}{x+4} \geq 1$

$\frac{5}{x+4} \geq 1$

$\frac{5}{x+4} - 1 \geq 0$

$\frac{5}{x+4} - \frac{x+4}{x+4} \geq 0$

$\frac{5-x-4}{x+4} \geq 0$

$\frac{1-x}{x+4} \geq 0$

$x = 1 \quad x \neq -4$

$-$ | $+$ | $-$

$-4 \quad 1$

$(-4, 1]$

c. $\frac{2x-1}{3x+4} < 5$

$\frac{2x-1}{3x+4} - 5 < 0$

$\frac{2x-1}{3x+4} - \frac{5(3x+4)}{3x+4} < 0$

$\frac{2x-1-15x-20}{3x+4} < 0$

$\frac{-13x-21}{3x+4} < 0$

$x \neq -4/3 \quad x = -21/13$

$-$ | $+$ | $-$

$\frac{-21}{13} \quad \frac{-4}{3}$

$(-\infty, -21/13) \cup (-4/3, \infty)$

d. $\frac{5}{x+1} > \frac{12}{x+1}$

$0 > \frac{12}{x+1} - \frac{5}{x+1}$

$0 > \frac{7}{x+1}$

$x \neq -1$

$-$ | $+$

-1

$(-\infty, -1)$

Most Difficult First: **Both Correct**

Pg. 159:
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