11 PreCal

Unit 6: Booklet 3

Equations and Inequalities

June 9th - June 16th

NAME: Answers

The last lesson of your Grade 11 PreCal career!!!!!!

U6:L5 Quadratic Inequalities (2 Variables)

You can express a quadrative inequality in two variable in one of the following forms:

$y < ax^2 + bx + c$
$y \leq ax^2 + bx + c$
$y > ax^2 + bx + c$
$y \geq ax^2 + bx + c$

The variables a, b and c are real numbers and $a \neq 0$

Unlike linear inequalities, the boundary for a quadratic inequality is a PARABOLA

The graph of a quadratic inequality is the set of (x,y) points that are solutions to the inequality.

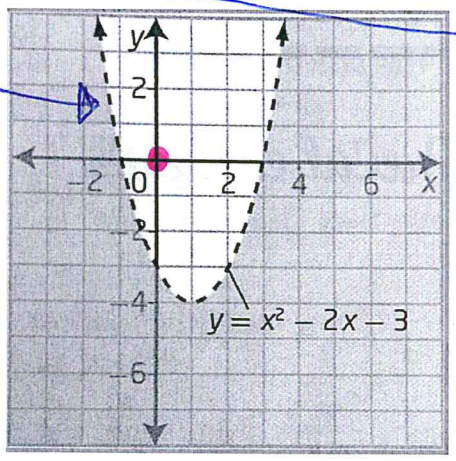
The same rules apply for boundaries as linear inequalities:

- DOTTED LINE is non-inclusive (< or >)
- SOLID LINE is inclusive (≤ or ≥)

Example 1:

Graph $y < x^2 - 2x - 3$

- Consider the equation $y = x^2 - 2x - 3$ for the boundary
- Your inequality symbol is <, therefore dotted (non-inclusive)
- Take a test point to determine the shaded region



Point (0,0) could be ANY point, but (0,0) is a nice EASY one ☺

$y < x^2 - 2x - 3$

$0 < 0^2 - 2(0) - 3$

$0 < 0 - 0 - 3$

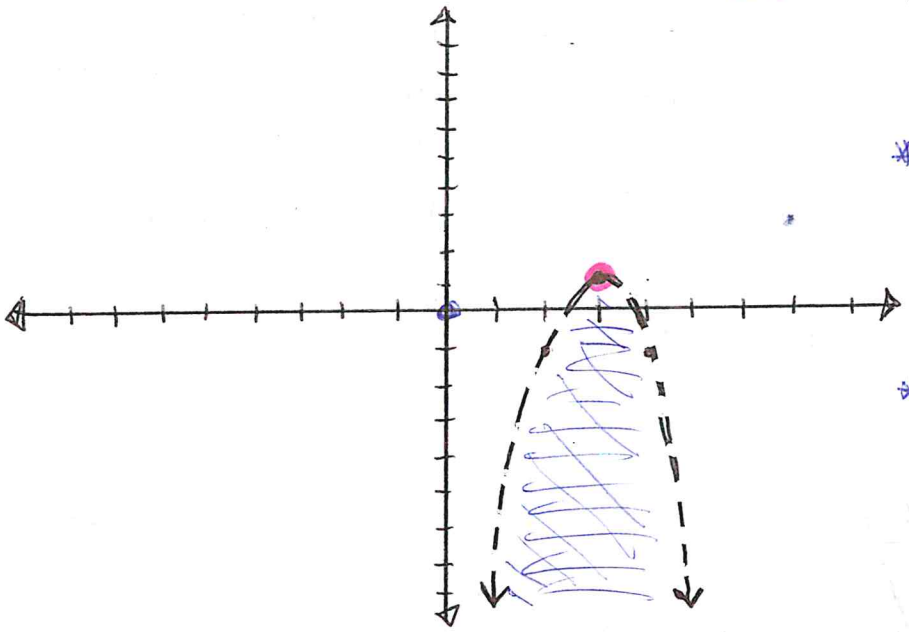
$0 < -3$ NOPE!

∴ OUTSIDE section is shaded

Example 2:

a) Graph $y < -2(x-3)^2 + 1$

STEP ONE: Graph the Boundary Parabola



use $y = -2(x-3)^2 + 1$ for boundary PARABOLA.

* Remember it is in vertex form $y = a(x-p)^2 + q$

(p, q) is vertex $\therefore (3, 1)$

* $a = -2$

$\therefore$ opens downwards

-2 = "slope"

STEP TWO: Determine Dotted or Solid Boundary Line

(<) symbol $\Rightarrow$ non-inclusive (DOTTED)

STEP THREE: Use a Test Point to Determine Shaded Region

(0,0)

$y < -2(x-3)^2 + 1$

$0 < -2(0-3)^2 + 1$

$0 < -2(-3)^2 + 1$

$0 < -2(9) + 1$

$0 < -18 + 1$

$0 < -17$ NO

(inside section shaded)

b) Determine if the point (2, -4) is a solution to the inequality.

$y < -2(x-3)^2 + 1$

$-4 < -2(2-3)^2 + 1$

$-4 < -2(-1)^2 + 1$

$-4 < -2(1) + 1$

$-4 < -2 + 1$

$-4 < -1$

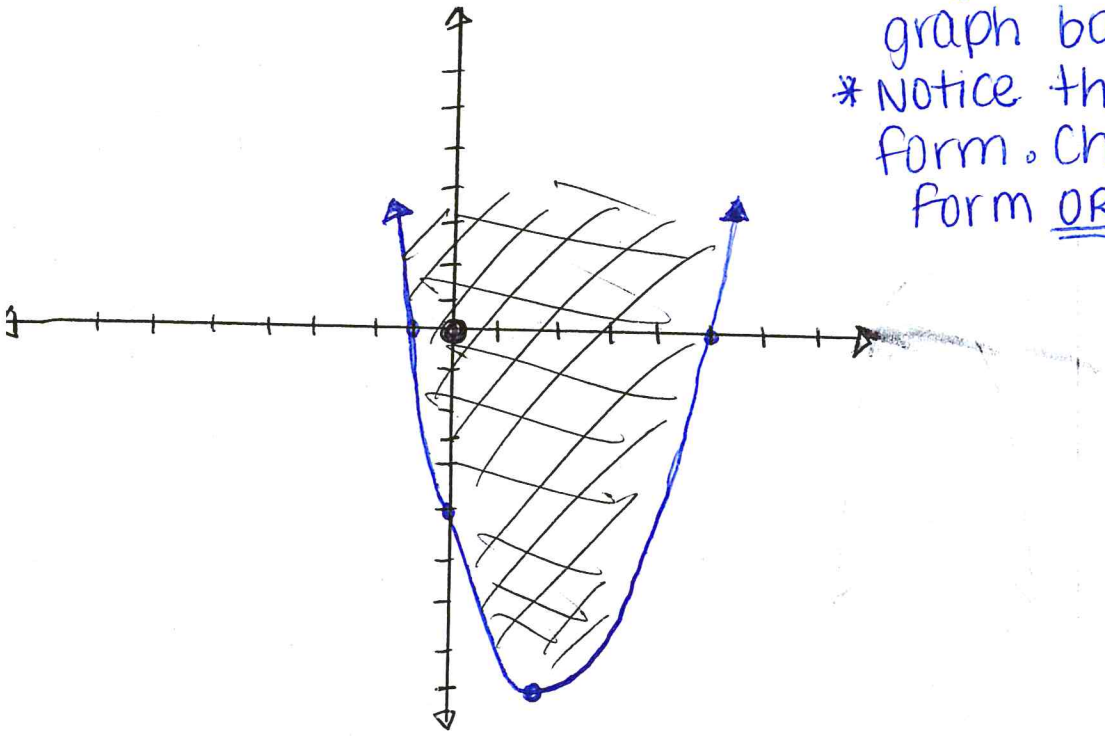
Yes!

Example 3:

Graph $y \geqslant x^2 - 4x - 5$

STEP ONE: Graph the Boundary Parabola

use $y = x^2 - 4x - 5$ to graph boundary.
* Notice this is in standard form. Change to vertex form OR use DESMOS!!



STEP TWO: Determine Dotted or Solid Boundary Line

$\geqslant$ symbol is inclusive (SOLID)

STEP THREE: Use a Test Point to Determine Shaded Region

(0,0)

$0 \geqslant 0^2 - 4(0) - 5$

$0 \geqslant 0 - 0 - 5$

$0 \geqslant -5$ yes! so inside is shaded.

PRACTICE: Page 496 Questions 1a, 1b, 3, 4a, 6a, 8a