Advanced Algebra II (H) Date Notes

Chap 3: Quadratics

Topic: Quadratic Inequalities

Today, we will....

(1) graph quadratic inequalities in two variables
(2) graph a system of quadratic inequalities
(3) solve a quadratic inequality algebraically
(4) solve a quadratic inequality by graphing

1. Graph quadratic inequalities in two variable

$y < -x^2 - 8x - 2$

① Graph $y = -x^2 - 8x - 2$

vertex: $x = \frac{8}{2(-1)} = -4$

$y = -16 + 32 - 2$

$= 14$

vertex $(-4, 14)$

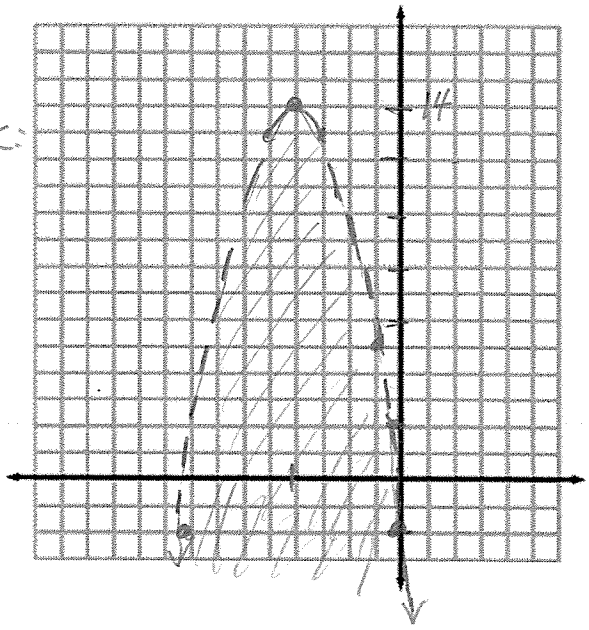
y-int $(0, -2)$

sym pt $(-8, -2)$

② Pick a pt & check: $(-2, 0)$

$0 \overset{?}{<} -4 + 16 - 2$

$0 < 10$ ✓



2. Graph a system of inequalities

$y < -x^2 + 3$

$y \geq x^2 + 2x - 3$

do by transformations or vertex

$y = x^2 + 2x - 3$

$x = -\frac{2}{2} = -1$ y-int $(0, -3)$

$y = 1 - 2 - 3$ sym pt $(-2, -3)$

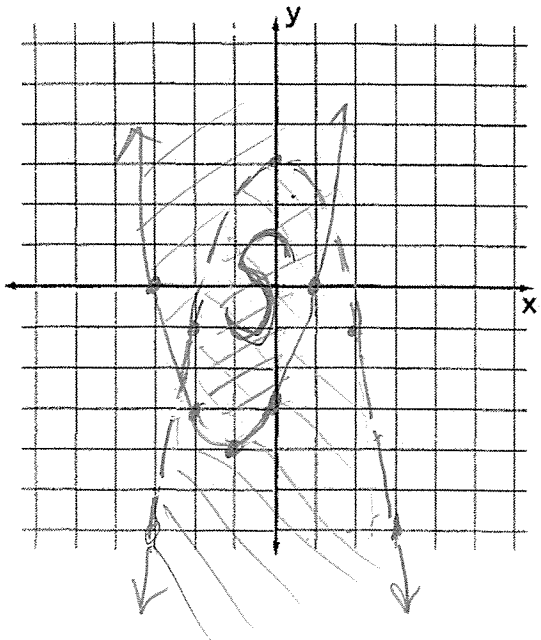
$= -4$

vertex $(-1, -4)$

roots:

$0 = (x + 3)(x - 1)$

$x = -3 \quad x = 1$



3. Solve a quadratic inequality algebraically

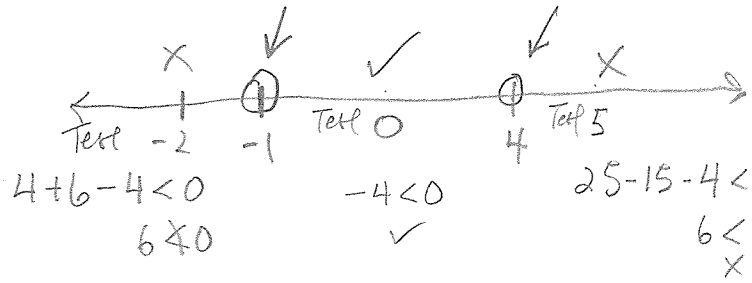
Solve algebraically: $x^2 - 3x - 4 < 0$

① Find x-intercepts for $x^2 - 3x - 4 = 0$

$(x-4)(x+1) = 0$

$x = 4 \quad x = -1$

② Make a # line & check each section.



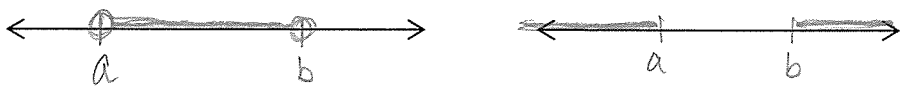
③ State solution statement.

$-1 < x < 4$

4. Solve a quadratic inequality by graphing

(note: "less thAND" and "greatOR" still work here)
Quick review: If "a" and "b" are the roots to the equation....

AND (pts in common) OR Combine together



Solve by graphing:
$3x^2 - x - 5 \geq 0$

$3x^2 - x - 5 = y$

vertex: $x = \frac{1}{6}$

$y = 3\frac{1}{36} - \frac{1}{6} - 5$

$= \frac{1}{12} - \frac{2}{12} - \frac{60}{12}$

$= -\frac{61}{12} = -5\frac{1}{12}$

$(\frac{1}{6}, -5\frac{1}{12})$

y-int $(0, -5)$

sym pt $(\frac{1}{3}, -5)$

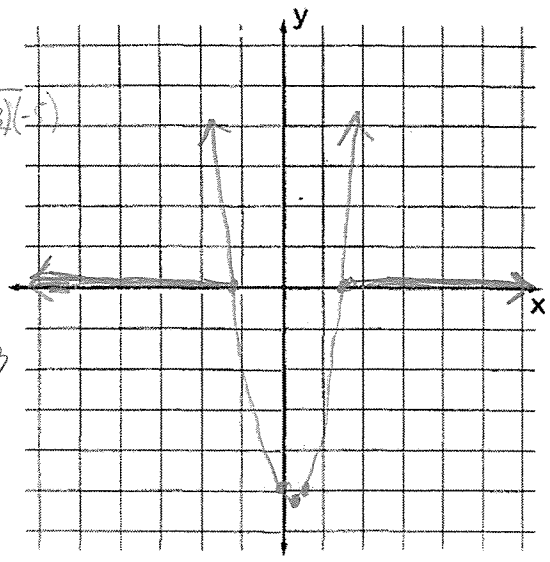
$3x^2 - x - 5 = 0$

$x = \frac{1 \pm \sqrt{1 - 4(3)(-5)}}{6}$

$\frac{1 \pm \sqrt{61}}{6}$

$x \approx 1.46$

$x \approx -1.13$



Check: $x = 2$

$3(4) - 2 - 5 \geq 0$

$5 \geq 0$ ✓

$x = -2$

$12 + 2 - 5 \geq 0$

$9 \geq 0$ ✓

$x \leq -1.13$ or $x \geq 1.46$

Advanced Algebra II (H) Date _____

Chap 3: Quadratics

Topic: Quadratic Inequalities - Application problems

1. A manila rope used for rappelling down a cliff can safely support a weight W (in pounds) provided

$$1480d^2 \geq W$$

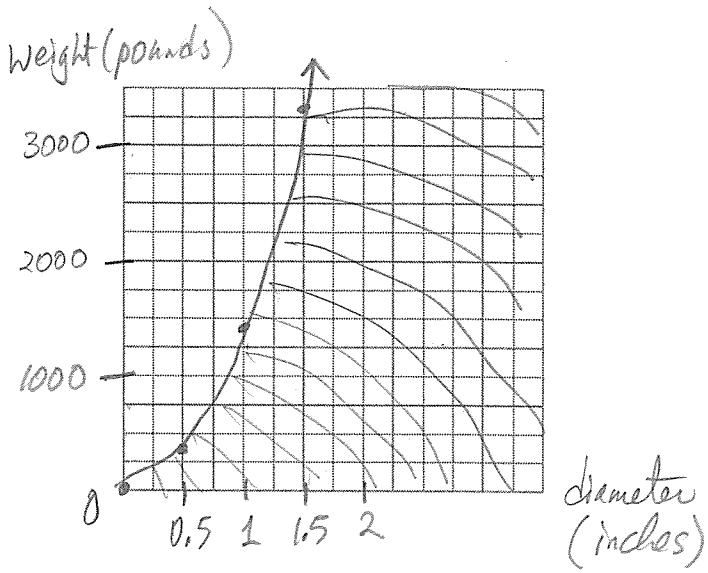
where d is the diameter (in inches) of the rope. Graph the inequality and interpret the solution.

Graph: $W = 1480d^2$ ↷ x

d	W
0.5	370
1	1480
1.5	3330
2	5920

Test (1,0)

$1480 \geq 0$ ✓



2. A rectangular parking lot must have a perimeter of 440 feet and an area of at least 8000 square feet. Describe the possible lengths of the parking lot. After setting up your equations/inequalities, use your graphing calculator. Copy the graph from your calculator.

$2L + 2W = 440 \rightarrow L + W = 220$

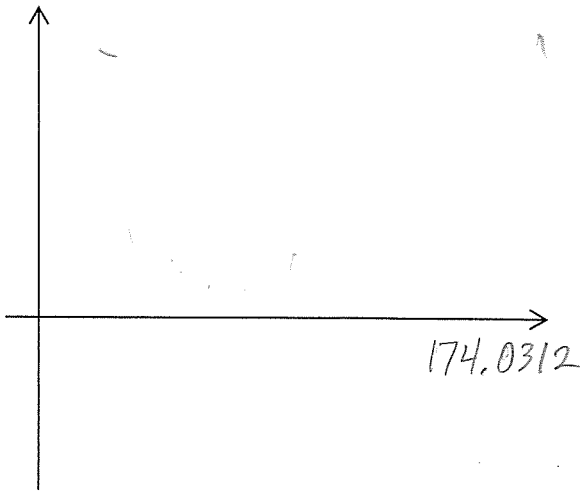
$L = 220 - W$

$LW \geq 8000$

$W(220 - W) \geq 8000$

$220W - W^2 \geq 8000$

$-W^2 + 220W - 8000 \geq Y$



Advanced Algebra II (H) Date Key

Chap 3: Quadratics

Topic: Quadratic Inequalities - Practice Problems

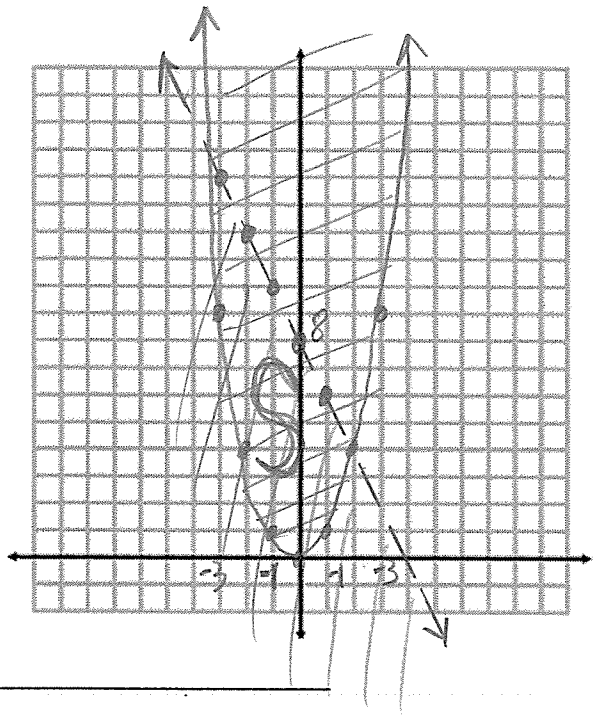
1. Solve this system by graphing.

$y \geq x^2$

$2x + y < 8$

$y \geq x^2$ Test (0,1) $1 \geq 0$ ✓

$y = -2x + 8$ Test (0,0) $0 < 8$ ✓



Solution statement(s) _____

2. $y \leq 2x + 10$

$y \geq -x^2 - 4x + 1$

Test (0,0) $0 \leq 10$ ✓

$y = -x^2 - 4x + 1$

$x = \frac{4}{-2} = -2$

$y = -4 + 8 + 1$

$y = 5$

vertex $(-2, 5)$

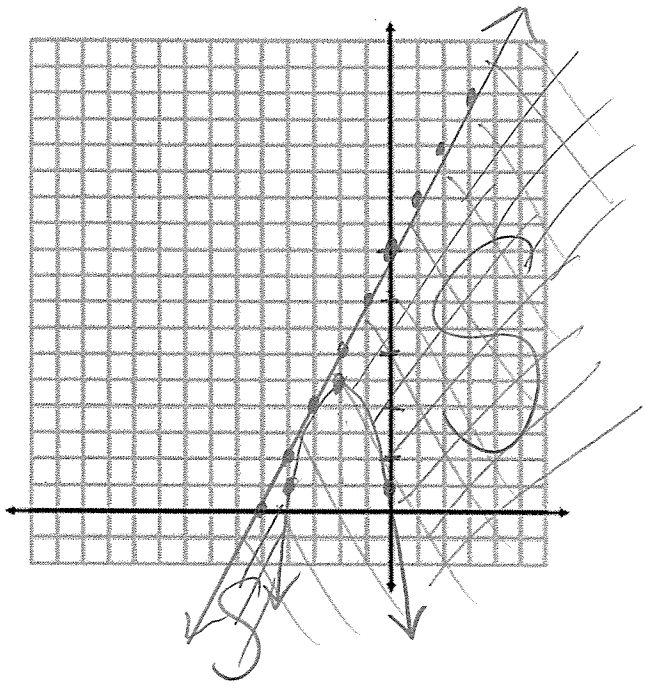
y-int $(0, 1)$

Sym pt $(-4, 1)$

Test $(-1, 0)$

$0 \geq -1 + 4 + 1$

$0 \geq 4$ X



Solution statement(s) _____

Solve these inequalities algebraically or by graphing.

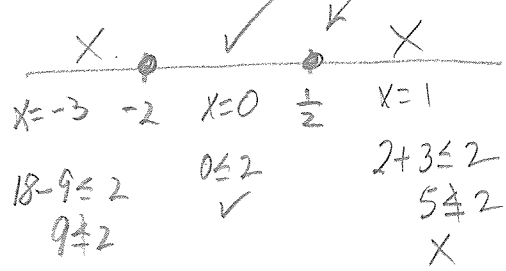
3. $2x^2 + 3x \leq 2$

$2x^2+3x-2=0$

$(2x-1)(x+2)=0$

$x=\frac{1}{2} \quad x=-2$

Tests: (inclusive)



Solution $\left\{-2 \leq x \leq \frac{1}{2}\right\}$

4. $-3x^2 - 4x + 1 \leq 0$

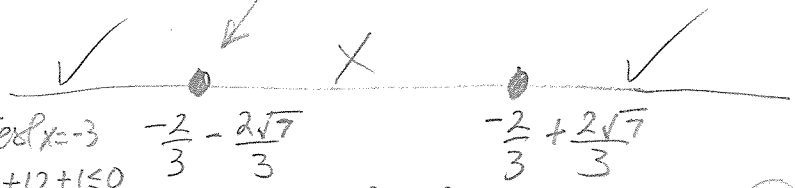
$-3x^2-4x+1=0$

$x=\frac{4 \pm \sqrt{16-4(-3)(1)}}{2(-3)}$

$=\frac{4 \pm \sqrt{28}}{-6}$

$=-\frac{2}{3} \pm \frac{1\sqrt{7}}{3}$ → ≈ 1.097, → ≈ -2.4305

Tests: (don't forget!)



$S: \left\{x \leq -\frac{2}{3} - \frac{\sqrt{7}}{3} \text{ or } x \geq -\frac{2}{3} + \frac{\sqrt{7}}{3}\right\}$

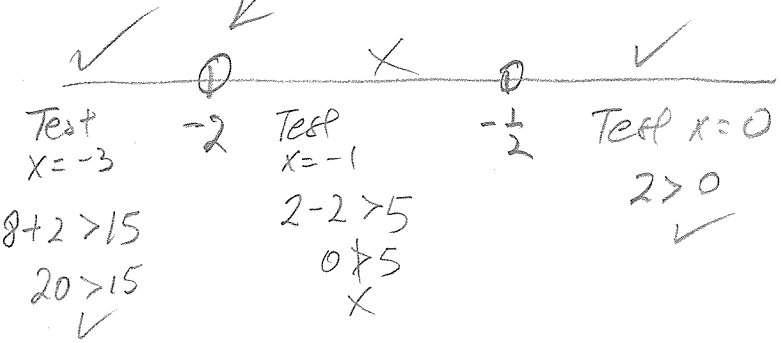
5. $2x^2 + 2 > -5x$

$2x^2+5x+2=0$

$(2x+1)(x+2)=0$

$x=-\frac{1}{2} \quad x=-2$

Tests: (*)



$S: \left\{x < -2 \text{ or } x > -\frac{1}{2}\right\}$