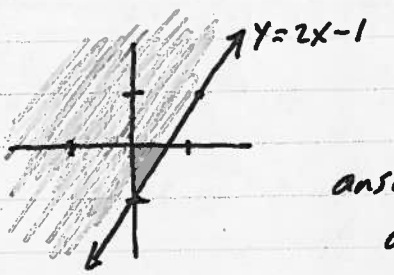
9.3 Quadratic Inequalities with 2 variables

linear inequality, 1 variable : $2x+3<5$

$2x<2$

$x<1$ answer is inequality

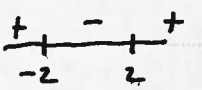
linear inequality, 2 variables: $y \geq 2x-1$



answer is a region of a graph

quadratic inequality, 1 variable $x^2-4<0$

$(x+2)(x-2)<0$



$-2<x<2$

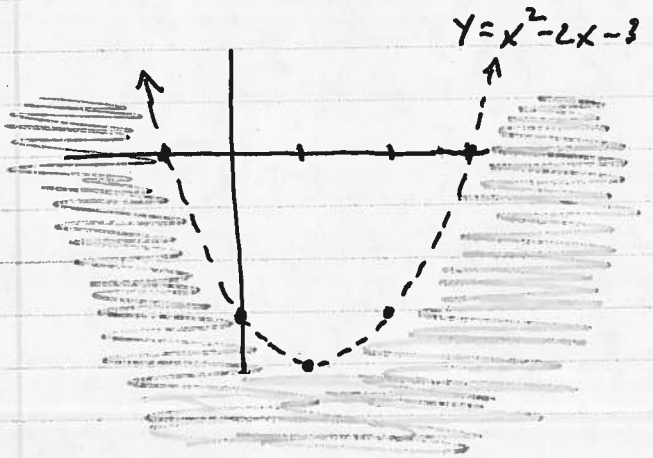
answer is inequality

quadratic inequality, 2 variables ... answer is a graph.

ex 1 $y<x^2-2x-3$ boundary $y=x^2-2x-3$ (dotted)

vertex $(1,-4)$

y int $(0,-3)$



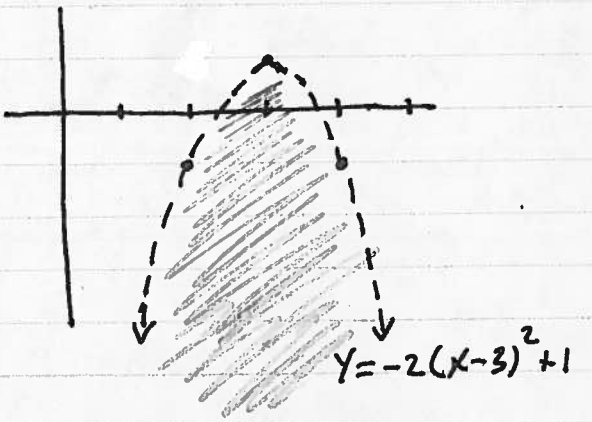
point check $(1,0)$

$0<1-2-3$

$0<-4$

$\therefore (1,0)$ not in region

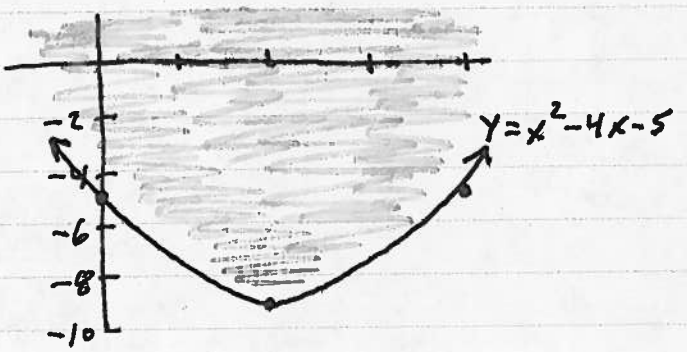
ex1 pg 490 $y < -2(x-3)^2+1$ vertex (3,1)



check (3,0)
$0 < -2(0)^2+1$
$0 < 1$
$\therefore$ (3,0) is in region

b) is (2,-4) a solution → graph says yes.
* without graphing $-4 < -2(2-3)^2+1$
$-4 < -2+1$
$-4 < -1$ ✓
it is a solution.

ex2 pg 492 $y \geq x^2-4x-5$ vertex (2,-9)
y int (0,-5) $\therefore$ (4,-5)



check (0,0)
$0 \geq -5$ ✓
$\therefore$ (0,0) is in region

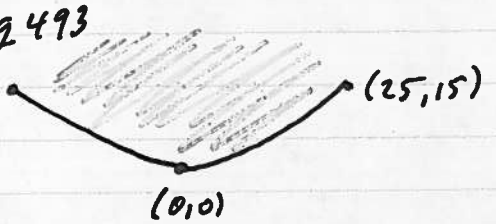
Do 1a, 2a, 3a, 8a pgs. 496-497 as examples

HW 1cd 2cd 3cd 8b
graphs 4bd, 5ac, 6cd, 7cd
* you can do more but these 8 represent everything we can throw at you

* check your answers.

9.3 Part 2 Word Problems

ex 3 pg 493



* not everyone uses the same origin so equation + work can vary (but answer won't)

$y-0 = a(x-0)^2$ (25,15)

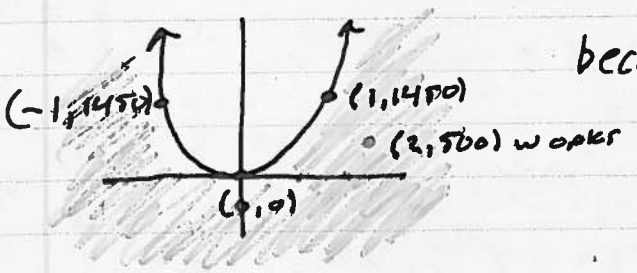
$15 = a(25)^2$

$\frac{15}{625} = a$

$\frac{3}{125} = a$ $\quad y = \frac{3}{125}x^2$ (obvious which side to shade but you can check (0,1) to verify)

ex 4 pg 495 $M \leq 1450d^2$

vertex (0,0)

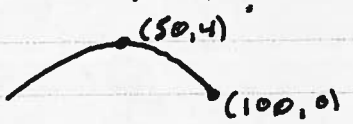


because $M \geq 0$

$d \geq 0$ only quadrant I works.

Do 9, 11, 13, 14, 15, 16 pgs 498-500

9a)



$y-4 = a(x-50)^2$

$0-4 = a(100-50)^2$

$-4 = 2500a$

$-\frac{1}{625} = a$

$y-4 = -\frac{1}{625}(x-50)^2$

$y = -\frac{1}{625}(x-50)^2 + 4$

b) $y < -\frac{1}{625}(x-50)^2 + 4$

$0 \leq x \leq 100$

11 a) $Y < -0.03x^2 + 0.84x - 0.08$

b) $0.2 \leq -0.03x^2 + 0.84x - 0.08$

$0 \leq -0.03x^2 + 0.84x - 0.28$

$Y_1 = -0.03x^2 + 0.84x - 0.28$

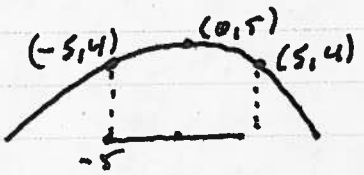
$Y_2 = 0$

calc intersect

$x = 0.34 \quad x = 27.66$

$[+0.34, 27.66]$

c) 27.32 m

13 a) 

$Y - 5 = a(x-0)^2$

$4 - 5 = a(5-0)^2$

$\frac{-1}{25} = a$

$Y = -\frac{1}{25}x^2 + 5$

b) $Y < -\frac{1}{25}x^2 + 5$

$-5 \leq x \leq 5$

→ can't be negative $0 \leq -\frac{1}{25}x^2 + 5$

14 a)

L_1	L_2
0	0
10	100
15	75

quad regression $Y = -x^2 + 20x$

$Y \leq -x^2 + 20x$ Y: revenue X: ads

b) $50 = -x^2 + 20x$

$x^2 - 20x + 50 = 0$

$x = \frac{20 \pm \sqrt{400 - 200}}{2}$

$x = 17.1 \quad (17)$

$x = 2.9 \quad (3)$ $\quad 3 \leq x \leq 17$

15. $-0.0002x^2 - 700 \leq Y \leq -0.0001x^2 - 600$

16. Revenue = Sales × price

a) $R = 400 \times 4$ $\quad x = 0.5$ increase

$R = (400 - 20x)(4 + 0.5x)$

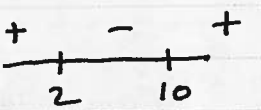
$R = -10x^2 + 120x + 1600$

b) $1800 \leq -10x^2 + 120x + 1600$

$0 \leq -10x^2 + 120x - 200$

$0 \geq x^2 - 12x + 20$

$0 \geq (x-10)(x-2)$



$2 \leq x \leq 10$ (increases)

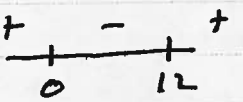
$5 \leq p \leq 9$ (price)

c) $1600 \leq -10x^2 + 120x + 1600$

$0 \leq -10x^2 + 120x$

$0 \geq x^2 - 12x$

$0 \geq (x)(x-12)$



$0 \leq x \leq 12$ (increases)

$4 \leq p \leq 10$ (price