8.1 Solving Systems of equations.

Desmos.com demonstration.

ex 2 pg 428 $4x - y + 3 = 0$ $2x^2 + 8x - y + 3 = 0$

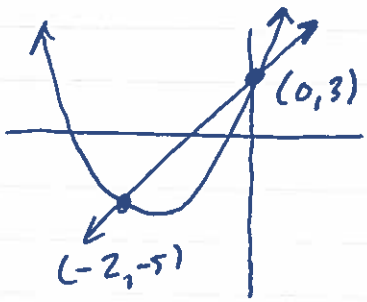
* "graphically" $4x + 3 = y$ $2x^2 + 8x + 3 = y$

$Y_1 = 4x + 3$ $Y_2 = 2x^2 + 8x + 3$

calc intersect

sketch solution

Xmin −5
Xmax 2
Ymin −10
Ymax 5



b) verify $(-2,-5)$ $4(-2) - (-5) + 3 = 0$ $2(-2)^2 + 8(-2) - (-5) + 3 = 0$

$-8 + 5 + 3 = 0$ $8 - 16 + 5 + 3 = 0$

$0 = 0$ ✓ $0 = 0$ ✓

$(0,3)$ $4(0) - 3 + 3 = 0$ $2(0)^2 + 8(0) - 3 + 3 = 0$

$0 - 3 + 3 = 0$ $0 + 0 - 3 + 3 = 0$

$0 = 0$ ✓ $0 = 0$ ✓

* algebraically $4x - y + 3 = 0$ $2x^2 + 8x - y + 3 = 0$

$\therefore 4x - y + 3 = 2x^2 + 8x - y + 3$

$0 = 2x^2 + 4x$

$0 = 2x(x + 2)$

$2x = 0$ $x + 2 = 0$

$x = 0$ $x = -2$

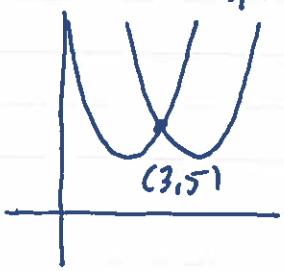
$(0,3)$ $(-2,-5)$

ex 3 pg 429 $2x^2-16x-y=-35$ $2x^2-8x-y=-11$ Desmos.com

$2x^2-16x+35=y$ $2x^2-8x+11=y$

$Y_1=2x^2-16x+35$ $Y_2=2x^2-8x+11$

Calc intersect.



Xmin -2
Xmax 10
Ymin -2
Ymax 10

b) verify (3,5) $2(3)^2-16(3)-5=-35$ $2(3)^2-8(3)-5=-11$

$18-48-5=-35$ $18-24-5=-11$

$-35=-35$ ✓ $-11=-11$ ✓

* algebraically $Y=2x^2-16x+35$ $Y=2x^2-8x+11$

$\therefore 2x^2-16x+35=2x^2-8x+11$

$-8x=-24$

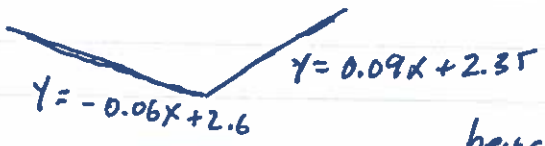
$x=3$

$Y=2(3)^2-8(3)+11$

$Y=18-24+11$

$Y=5$ (3, 5)

ex 4 pg 430



Desmos.com * all 3 at once

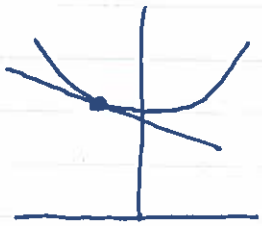
being replaced with $Y=0.0045x^2+2.8$

$Y_1=-0.06x+2.6$

$Y_2=0.0045x^2+2.8$

calc intersect

(-6.67, 3)

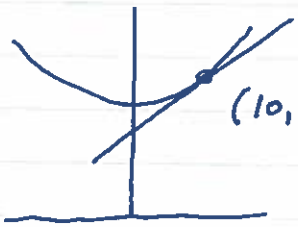


Xmin -20
Xmax 20
Ymin 0
Ymax 5

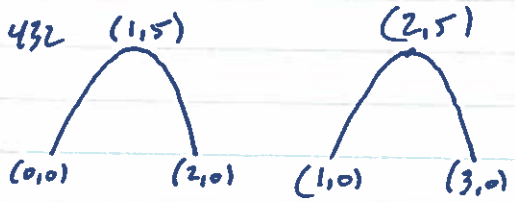
$Y_1=0.09x+2.35$

$Y_2=0.0045x^2+2.8$

Calc intersect



ex 5 pg 432



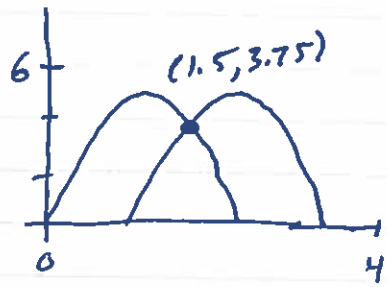
$y = a(x-1)^2 + 5$ $\quad$ $y = a(x-2)^2 + 5$

(0,0) $0 = a(1) + 5$ $\quad$ (1,0) $0 = a(1-2)^2 + 5$

$-5 = a$ $\quad$ $-5 = a$

a) $Y_1 = -5(x-1)^2 + 5$ $\quad$ $Y_2 = -5(x-2)^2 + 5$

b) Calc intersect



(c) they high five at a height of 3.75 m, 1.5 seconds after the first person is launched.

① 1-7 pgs 435-436

② pgs 436-439 8, 9, 10, 11, 13, 15, 17, 20

1 a) System A B and D launch from the same height. C launches from ground.

b) the intersection is a point at which the distance away from the ramp, x, and the height, y, are equal.

2 (0,-5): $-5 = -(0)^2 + 4(0) - 5$ $\quad$ $-5 = 0 - 5$

$-5 = -5$ ✓ $\quad$ $-5 = -5$ ✓

(3,-2) $-2 = -(3)^2 + 4(3) - 5$ $\quad$ $-2 = 3 - 5$

$-2 = -9 + 12 - 5$ $\quad$ $-2 = -2$ ✓

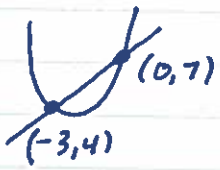
$-2 = -2$ ✓

3 a) linear - quadratic (-4,1) and (-1,-2)

b) quadratic - quadratic no solution

c) linear - quadratic (1,-4)

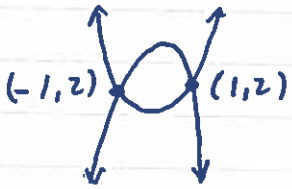
4a) $Y_1 = x+7$
$Y_2 = (x+2)^2+3$



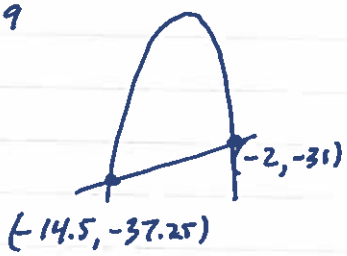
verify (0,7): $0+7=7$ ✓, $2^2+3=7$ ✓
(-3,4): $-3+7=4$ ✓, $(-1)^2+3=4$ ✓

b) $Y_1 = -x+5$
$Y_2 = \frac{1}{2}(x-4)^2+1$

d) $Y_1 = 3-x^2$
$Y_2 = x^2+1$

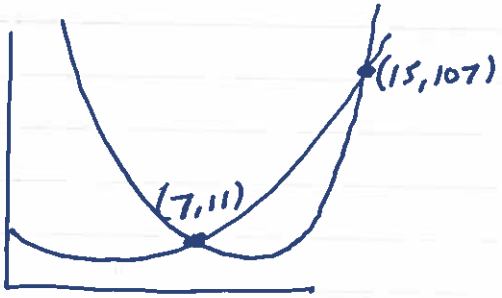


c) $Y_1 = -x^2-16x-59$
$-2Y_2 = 60-x$
$Y_2 = -30+\frac{1}{2}x$



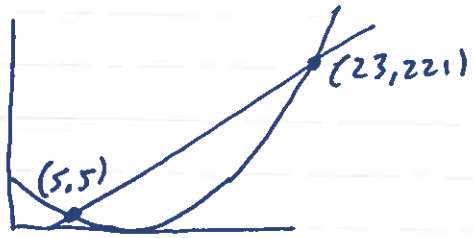
Xmin -40
Xmax 10
Ymin -40
Ymax 10

e) $Y_1 = x^2-10x+32$
$Y_2 = 2x^2-32x+137$



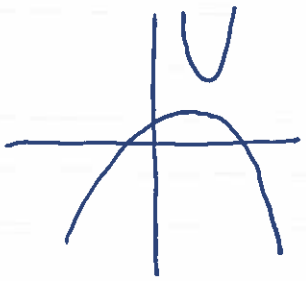
Xmin 0
Xmax 20
Ymin 0
Ymax 120

5a) $Y_1 = x^2-16x+60$
$Y_2 = 12x-55$



Xmin 0
Xmax 30
Ymin 0
Ymax 300

b) $Y_1 = 3x^2-12x+17$
$Y_2 = -0.25x^2+0.5x+1.75$



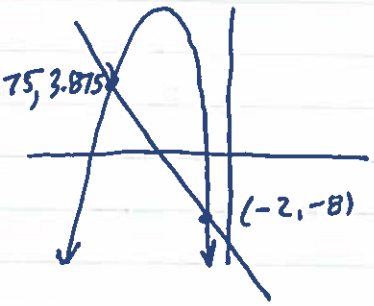
$-10 \le x \le 10$
$-10 \le y \le 10$

no solution

Pg 436

5c) $Y_1 = -2x^2 - 20x - 40$

$Y_2 = -\frac{5}{2}x^{\blacksquare} - 13$



$-10 \le x \le 10$

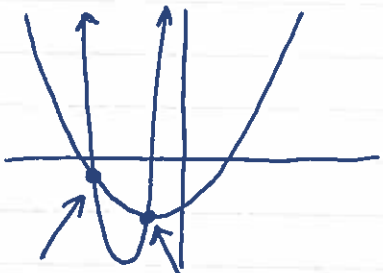
$-10 \le y \le 10$

5d) $n^2 + 2n - 7 = 2m$

$Y_1 = \frac{1}{2}x^2 + x - \frac{7}{2}$

$3n^2 + 12n + 6 = m$

$Y_2 = 3x^2 + 12x + 6$



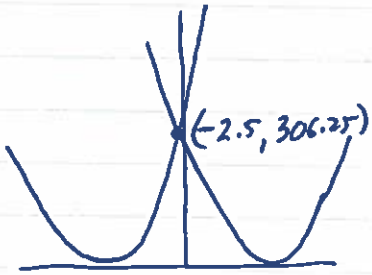
$-10 \le x \le 10$

$-10 \le y \le 10$

(-3.21, -1.541) (-1.18, -3.981)

5e) $Y_1 = x^2 + 40x + 400$

$Y_2 = x^2 - 30x + 225$



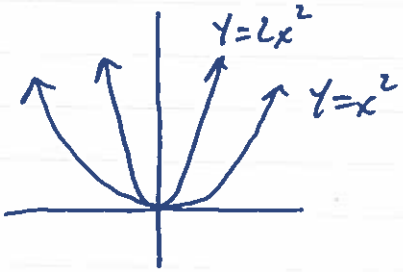
$-30 \le x \le 30$

$0 \le y \le 400$

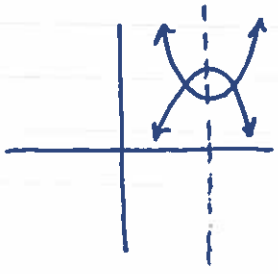
6. same "slope", different vertex

$Y = x^2$ $Y = (x-3)^2$

Same vertex, different "slope"



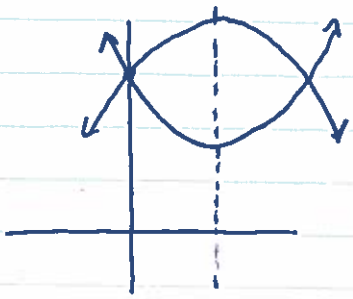
7a)



2 solutions

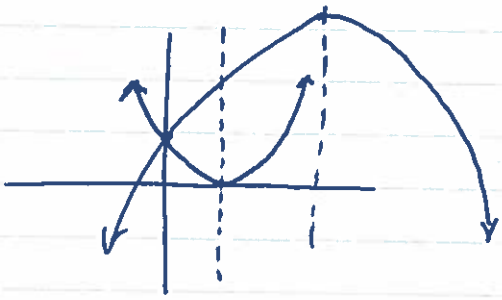
Same axis of symmetry.

7b)



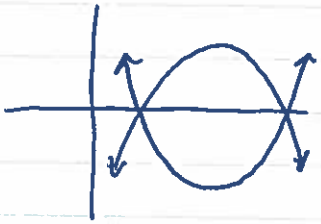
same axis of symmetry
same Y intercept
2 solutions

7c)



2 solutions
same Y intercept
different axis of symmetry

7d)



2 solutions
same x intercepts.

8 a) $Y = -3$ (no solutions)
b) $Y = -2$ (1 solution)
c) $Y = 1$ (2 solutions)

9, 10, 11, 13, 15, 17, 20

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#9 a) (100, 3300) (1000, 8000)

b) if he sells 100 – 1000 shirts he will not lose money

c) 500 shirts Revenue = 15000 Cost = 5500 Profit 9500
↑ approximately

#10 $Y_1 = -0.04x + 3.9$

$Y_2 = 0.001x^2 - 0.04x + 3.9$

(0, 3.9)

* Zoom fit
* Calc intersect

$Y_1 = 0.03x + 2.675$

$Y_2 = 0.001x^2 - 0.04x + 3.9$

(35, 3.725)

#11 a) $Y_1 = 1.16x^2$

$Y_2 = 1.74(x-3)^2$

b) $0 \le x \le 20$ (accelerates for 20 seconds)

c) Calc intersect

(16.3, 310.0)

(1.65, 3.16)
↑ discard. (after 1.65 seconds the 2nd car hasn't started)

d) after 16.3 seconds both cars are at the 310 m mark (16 s after car 1 starts)

#13 $x + y = 21$ $2x^2 - 15 = y$ (y is larger)

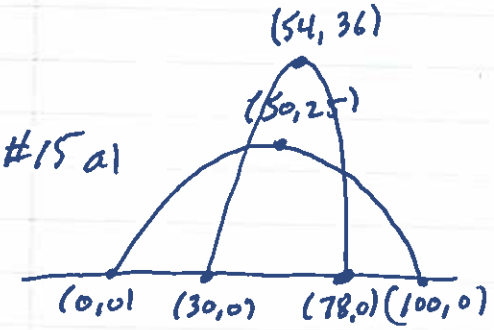
$Y_1 = 21 - x$ $Y_2 = 2x^2 - 15$

calc intersect (4, 17)

(-4.5, 25.5) discard, not integers

4 and 17

#15 a)



b) frog $y - 25 = a(x-50)^2$

$y - 25 = -0.01(x-50)^2$

grasshopper $y - 36 = a(x-54)^2$

$y - 36 = -.0625(x-54)^2$

↑ found a using quadreg

#17 a) linear (-1, 2) (2, 5) slope $\frac{3}{3} = 1$ $y = 1x + b$ (2, 5)

$5 = 2 + b$

$3 = b$

$\boxed{y = x + 3}$

quadratic: let $(-1,2)$ be vertex $\quad y-2=a(x+1)^2 \quad (2,5)$

$5-2=a(2+1)^2$

$3=9a$

$\frac{1}{3}=a$

$\boxed{y=\frac{1}{3}(x+1)^2+2}$

b) $\boxed{y=\frac{1}{3}(x+1)^2+2}$

let $(2,5)$ be vertex $\quad y-5=a(x-2)^2 \quad (-1,2)$

$2-5=a(-1-2)^2$

$-3=9a$

$-\frac{1}{3}=a$

$\boxed{y=-\frac{1}{3}(x-2)^2+5}$

c) get 1 equation for parabola, like $\boxed{y=x^2+1}$

and perform same operation on both sides

ie $y+2x=x^2+1+2x$

$y+2x=(x^2+2x+1)$

$\boxed{y=(x+1)^2-2x}$

#20 a) $y=x^2$, $y=x+1$ $\quad\therefore\quad x^2=x+1$

$x^2-x-1=0 \qquad b^2-4ac=5 \quad\therefore$ 2 roots

b) $2x^2+3=-2x-5$

$2x^2+2x+8=0 \qquad b^2-4ac=-60 \quad\therefore$ no roots

c) $(x-4)^2+1=\frac{1}{3}(x-4)^2+2$

$\frac{2}{3}(x-4)^2=1$

$(x-4)^2=\frac{3}{2} \quad\therefore$ 2 roots

d) $2(x+8)^2-9=-2(x+8)^2-9$

$4(x+8)^2=0$

$(x+8)^2=0 \quad\therefore$ 1 root

e) $2(x-3)^2+1=-2(x-3)^2-1$

$4(x-3)^2=-2 \qquad (x-3)^2=-1/2$ no solution

f) $(x+5)^2-1=x^2+10x+24$

$x^2+10x+24=x^2+10x+24$

$\therefore$ infinite number of solutions