1) (a) narrower
up 3 units

(b) reflected over x-axis
narrower
right 5

(c) wider
left 6
down 6

2) a. $f(3) = -2(3)^2 + 5(3) - 9$
$-18 + 15 - 9$
-12

$f(7) = -2(7)^2 + 5(7) - 9$
-72

$$\text{arc} = \frac{-72-(-12)}{7-3}$$
$$= \frac{-60}{4}$$
$$= -15$$

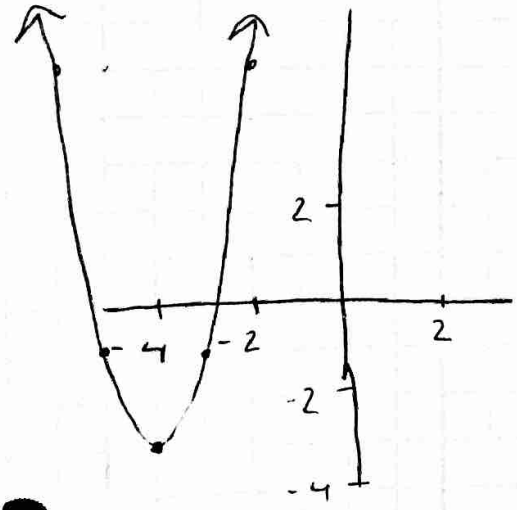
b. $g(3) = 3(3)^2 + 5(3) - 1$
$= 27 + 15 - 1$
41

$g(7) = 3(7)^2 + 5(7) - 1$
$= 181$

$$\text{arc} = \frac{181-41}{7-3}$$
$$= \frac{140}{4}$$
$$= 35$$

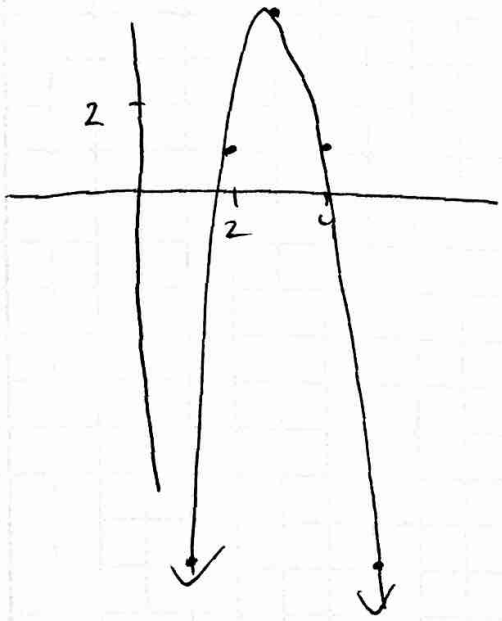
3) a. $f(x) = 2(x+4)^2 - 3$

V: $(-4, -3)$
a.o.s $x = -4$



b. $f(x) = -3(x-3)^2 + 4$

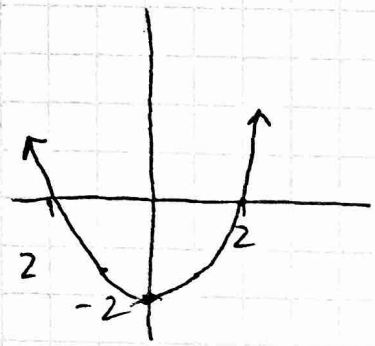
V $(3, 4)$
aos $x = 3$



c) $h(x) = \frac{1}{2}(x)^2 - 2$

v: $(0, -2)$

a.o.s. $x = -2$



5) $f(x) = a(x-15)^2 + 21$

$2 = a(0-15)^2 + 21$

$-19 = 225a$

$-\frac{19}{225} = a$

$f(x) = \frac{-19}{225}(x-15)^2 + 21$

6) a) $f(x) = x^2 + 6x + 1$

y: $(0, 1)$ $\quad x = \frac{-6}{2(1)}$ $\quad f(-3) = (-3)^2 + 6(-3) + 1$

$x = -3$ $\quad = 9 - 18 + 1$

a.o.s. $x = -3$ $\quad = -8$

v: $(-3, -8)$

b) $f(x) = 2x^2 - 8x - 3$

y: $(0, -3)$ $\quad x = \frac{-(-8)}{2(2)}$

a.o.s. $x = 2$ $\quad x = 2$

$f(2) = 2(2)^2 - 8(2) - 3$

$= 8 - 16 - 3$

-11

v: $(2, -11)$

c. $f(x) = -x^2 + 12x + 4$

y: $(0, 4)$ $\quad x = \frac{-12}{2(-1)}$ $\quad f(6) = -6^2 + 12(6) + 4$

a.o.s. $x = 6$ $\quad x = 6$ $\quad = -36 + 72 + 4$

$= -32$

v: $(6, -32)$

4a) $f(x) = a(x+3)^2 - 4$

$6 = a(2+3)^2 - 4$

$10 = 25a$

$\frac{2}{5} = a$

$f(x) = \frac{2}{5}(x+3)^2 - 4$

b) $f(x) = a(x-2)^2 + 2$

$-12 = a(4-2)^2 + 2$

$-14 = 4a$

$-\frac{7}{2} = a$

$f(x) = -\frac{7}{2}(x-2)^2 + 2$

c) $f(x) = a(x+2)^2 + 7$

$23 = a(5+2)^2 + 7$

$16 = 49a$

$\frac{16}{49} = a$

$f(x) = \frac{16}{49}(x+2)^2 + 7$

7] a. $f(x) = 2(x+4)^2 - 3$
$= 2(x^2+8x+16) - 3$
$= 2x^2 + 16x + 32 - 3$
$f(x) = 2x^2 + 16x + 29$

b. $f(x) = -(x-3)^2 + 5$
$= -(x^2 - 6x + 9) + 5$
$= -x^2 + 6x - 9 + 5$
$f(x) = -x^2 + 6x - 4$

8] a. $h(t) = -16t^2 + 48t + 25$

$x = \frac{-48}{2(-16)}$

$h(1.5) = -16(1.5)^2 + 48(1.5)$

$h(1.5) = 61$ $\quad x = 1.5$

V: $(1.5, 61)$

b. $h(t) = -16t^2 + 64t + 5$

$x = \frac{-64}{2(-32)}$

$x = 2$

$h(2) = -16(2)^2 + 64(2) + 5$

$h(2) = 69$

$(2, 69)$

c. $h(t) = -16t^2 + 937$

V: $(0, 937)$

9] a. $h(t) = -16t^2 + 20t + 6$

$x = \frac{-20}{2(-16)}$

$x = .625$

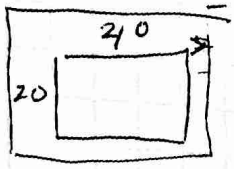
$f(.625) = -16(.625)^2 + 20(.625) + 6$
$= 12.25$

V $(.625, 12.25)$

a. max height is 12.25 ft
b. .625 seconds

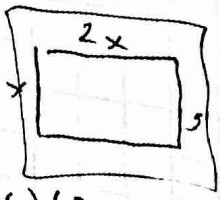
c. $h(1) = -16(1) + 20(1) + 6$
$= 10$ feet

10]



$(20+2x)(40+2x)$
$800 + 120x + 4x^2$ ft^2

11]



$(x+6)(2x+6)$
$2x^2 + 18x + 36$ ft^2

12]
a. $f(x) = 2(x-5)^2 - 2$
b. $f(x) = -x^2 + 3$
c. $f(x) = \frac{1}{2}(x+14)^2$

13) a. $f(x) = 3(x+1)(x-3)$

$0 = x+1$ $\quad$ $0 = x-3$

$-1 = x$ $\quad$ $3 = x$

$(-1,0)$ $\quad$ $(3,0)$

$x = \frac{-1+3}{2}$

$x = 1$

$f(1) = 3(1+1)(1-3)$

$= 3(2)(-2)$

$= -12$

V: $(1,-12)$

b. $f(x) = x^2 + 4x - 21$

$= (x+7)(x-3)$

$0 = x+7$ $\quad$ $0 = x-3$

$-7 = x$ $\quad$ $3 = x$

$(-7,0)$ $\quad$ $(3,0)$

$x = \frac{-7+3}{2}$

$x = -2$

$f(-2) = (-2+7)(-2-3)$

$= (+5)(-5)$

$= -25$

V: $(-2,-25)$

c. $f(x) = 2x^2 + 5x - 3$

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

$2x-1=0$ $\quad$ $x+3=0$

$x = \frac{1}{2}$ $\quad$ $x = -3$

$x = \frac{-3+\frac{1}{2}}{2}$

$x = -1.25$

$f(-1.25) = 2(-1.25)^2 + 5(-1.25) - 3$

$= -6.125$

V: $(-1.25, -6.125)$

14) $f(x) = x^2 - 6x + 5$

$= (x-5)(x-1)$

$x = 5$ $\quad$ $x = 1$

$(5,0)$ $(1,0)$

$x = \frac{5+1}{2}$

$x = 3$

$f(3) = 3^2 - 6(3) + 5$

$= 9 - 18 + 5$

$= -4$