10.2
Parabolas

Write each equation in standard fom .Identifythe vertex , axis of symmetry and direction of the opening

1) $Y = 2x^2-24x +40$ → Vertical parabola $y=\ldots\ldots$

$= (2x^2-24x) + 40$

$= 2 (x^2 - 12x) + 40$

2 x 6 → 6^2

$y= 2(x^2 - 12x + 36) +40- 2(36)$ → $Y = 2(x – 6)^2 -32$

Vertex : (h , k) =(6 , -32)

Axis of symmetry : x= h …….x = 6 (// to y axis)

a = + 2 ……..direction of opening is upward

2) $x+3y^2+12y=18$

$X = -3y^2 - 12y + 18$

$X = (-3y^2 - 12y) + 18$

$X = -3(y^2 + 4y) + 18$

$= -3(y^2 + 4y+4) + 18 - (-3)(4)$

$= -3(y+2)^2+30$

Vertex (30 ,-2)

Axis of symm. …..y = k ……..y=-2

Opening : a <0 ……..a = -3 ……left

Write an equation for each parabola then graph it

1) Vertex (9,6) , focus (9,5)

vertex = (h, k) = (9,6)

h = 9 (repeated) …….. Vertical Parabola

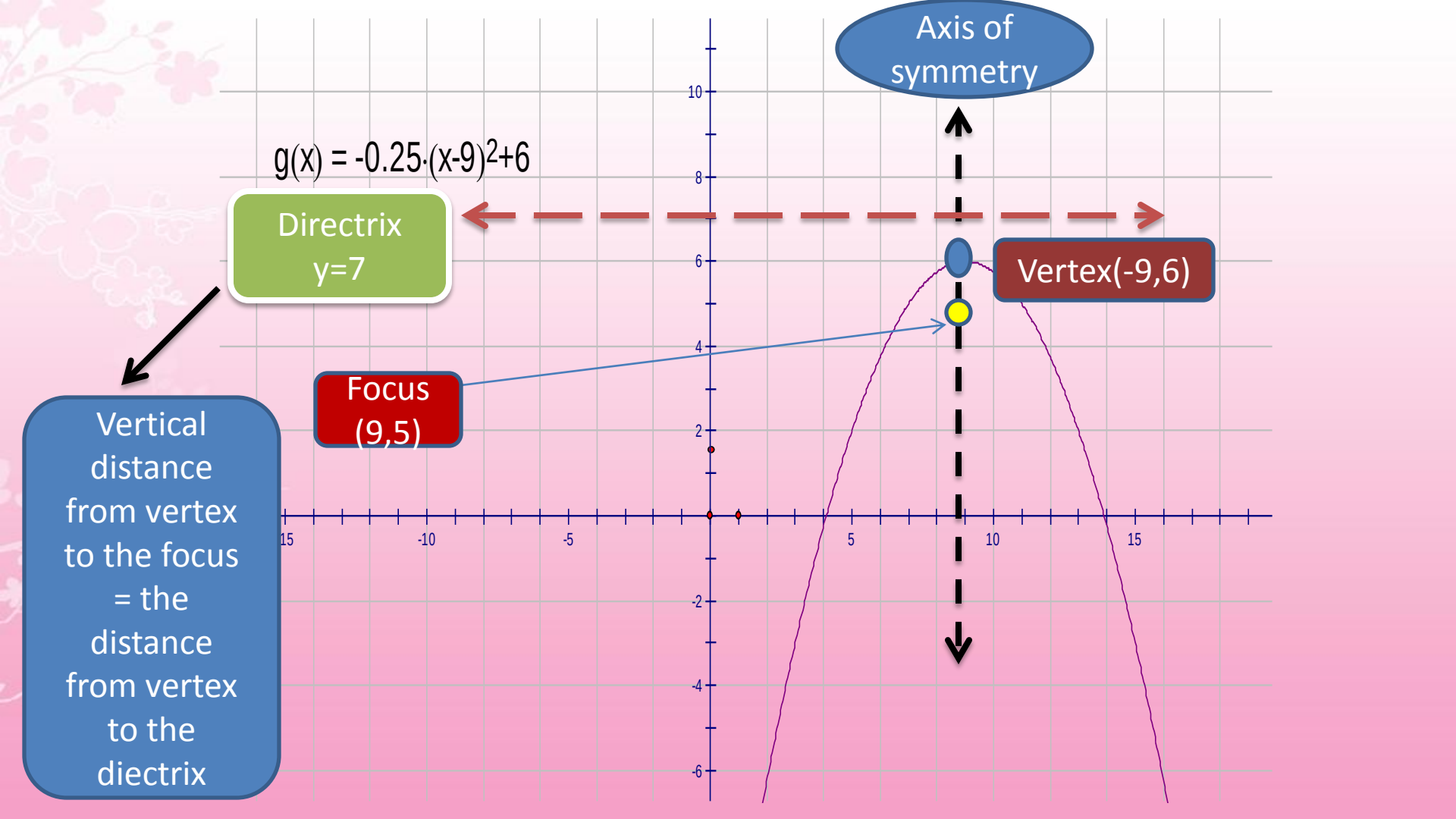
k= 6

focus (h, k+1/4a)= (9,5)……..so we can find a

k+1/4a = 5 ……6 + 1/4a = 5 ……1/4a = -1 …….. a = -1/4

equation : y = a (x-h)+k

y = -1/4 (x-9) + 5


Axis of symmetry
g(x) = -0.25·(x-9)²+6
Directrix y=7
Vertex(-9,6)
Focus (9,5)
Vertical distance from vertex to the focus = the distance from vertex to the diectrix
10
8
6
4
2
-2
-4
-6
15
-10
-5
5
10
15

2) Vertex (1,8) and the directrix y = 3

Vertex =(h , k) = (1 , 8)…….h=1 and k = 8

Directrix ….y = 3 (st. line // to x-axis)

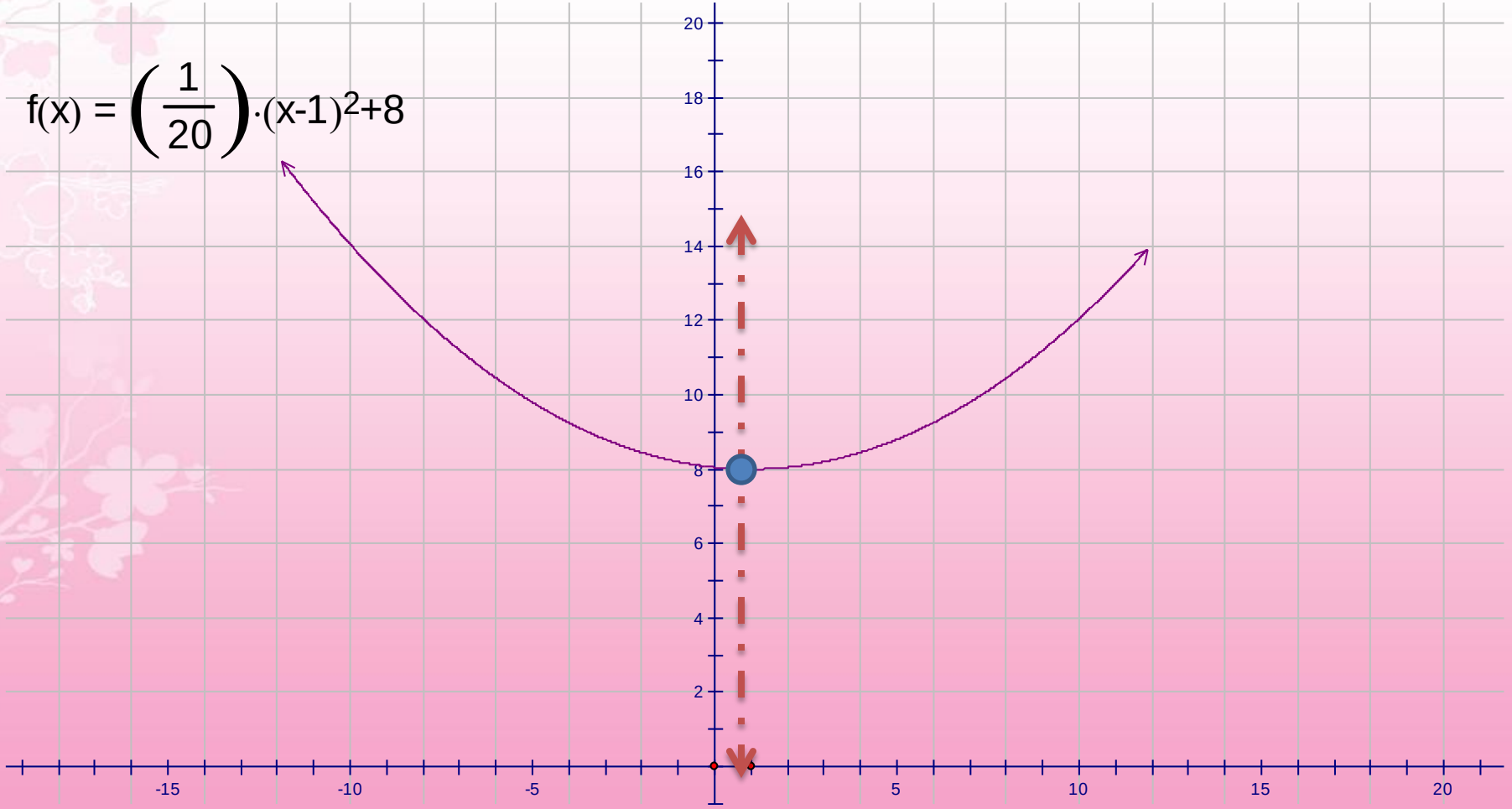
So it’s a vertical parabola

$y = k – 1/4a$ ……a = 1/20

Equation of the parabola is :

$y = a(x – h)^2 + k$ ……y = $1/20 (x-1)^2+8$

$$f(x) = \left(\frac{1}{20}\right)\cdot(x-1)^2+8$$



3) Focus (2,4)and the directrix ,x = 10

Direrctrix : x = 10 (st. line //to y- axis)

It is a horizontal parabola

x = h-1/4a ……10 = h-1/4a……..(1)

Focus is (2,4) = (h+1/4a , k)

k=4

And 2 = h+1/4a ……..(2)

Solve the 2 equations simaltnously

$$10 = h - 1/4a$$
$$2 = h + 1/4a$$

add

$$2h = 12$$

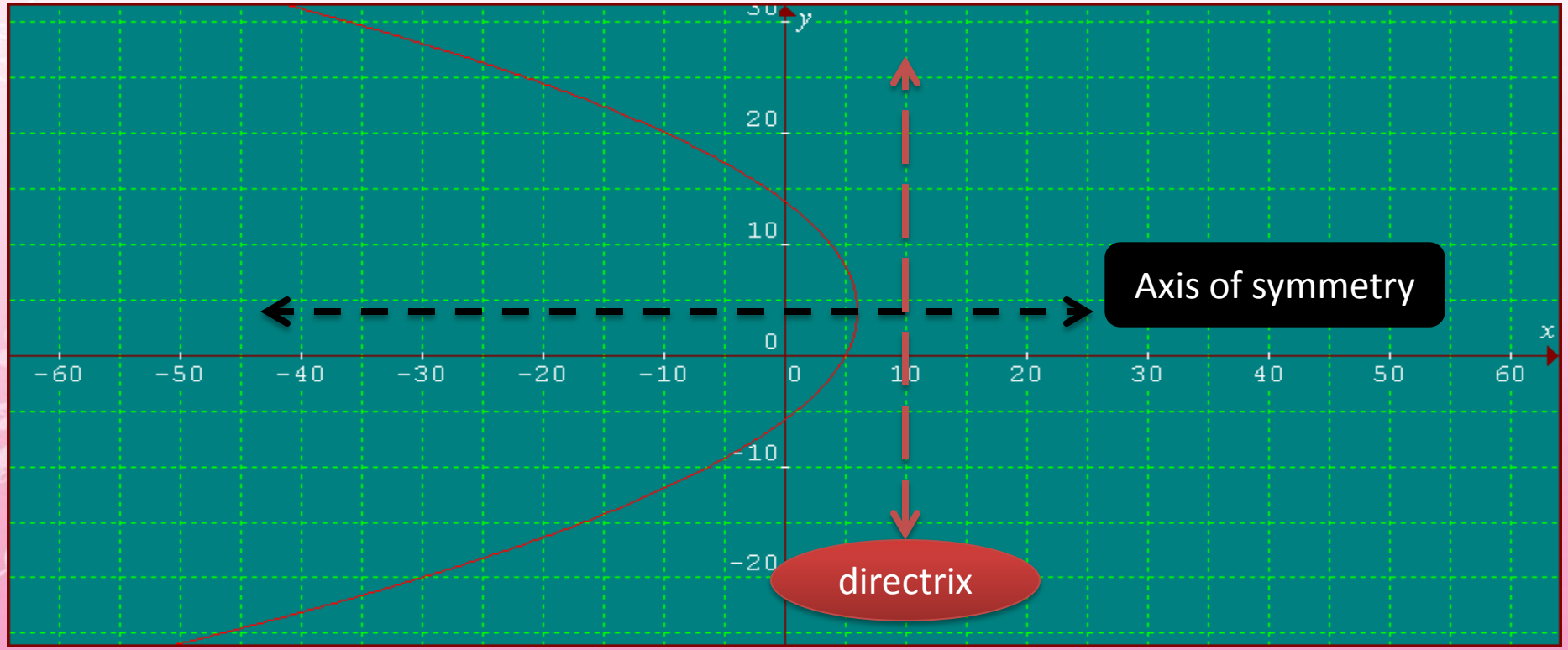
$$h = 6$$

substitute in eq. 1 or 2 to find a

$$a = -1/16$$

Equation of the horizontal parabola is : $x = a(y - k)^2 + h$

$x = -1/16(y-4)^2+6$



Graph the following equation :

1) $y= (x-4)^2-6$

a =1

Vertex :(h,k)= (4,-6) ……vertical parabola

Axis of symmetry: x =h……x=4

Focus : (h, k+1/4a) = (4,-5.75)

Directrix : y =k-1/4a …….y=-6.25

Length of latus rectum =|1/a|=1 unit

$y = (x-4)^2 - 6$

x	y
4	-6
3	-5
2	-2