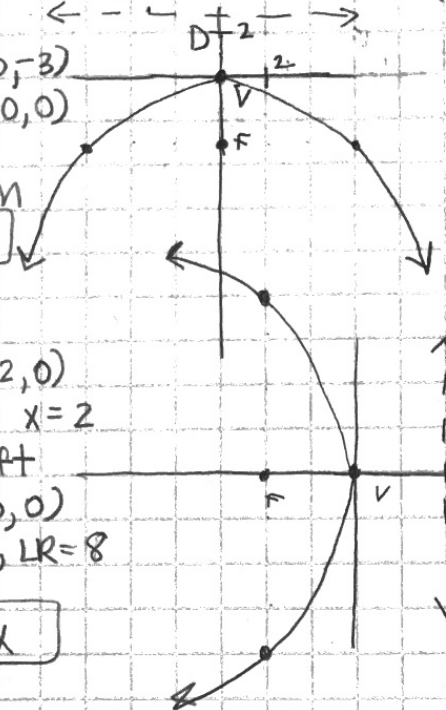


7.8 Applications of Parabolas and Ellipses

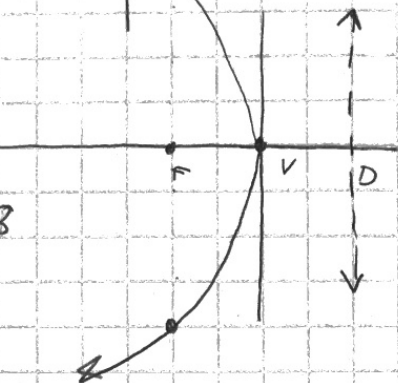
1. focus $(0, -3)$
vertex $(0, 0)$

$p = -3$
opens down
 $x^2 = -12y$
LR = 12



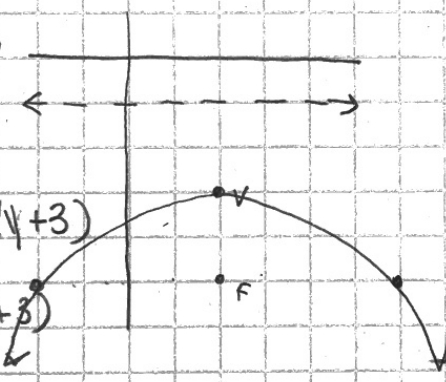
2. focus $(-2, 0)$
directrix $x = 2$
opens left
vertex $(0, 0)$
 $p = -2$, LR = 8

$y^2 = -8x$



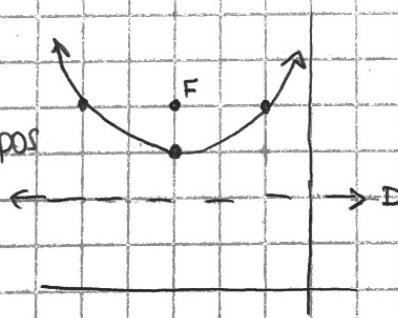
3. vertex $(2, -3)$
focus $(2, -5)$
opens down

$p = 2$
 $(x+2)^2 = -4(2)(y+3)$
 $(x-2)^2 = -8(y+3)$
LR = 8

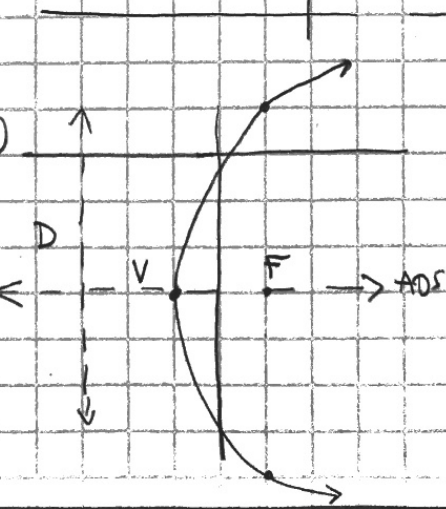


4. focus $(-3, 4)$
directrix $y = 2$
opens up $\rightarrow x^2 + pos$
vertex $(-3, 3)$
 $p = 1$, LR = 4

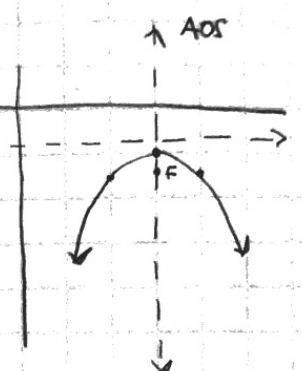
$(x+3)^2 = 4(y+3)$



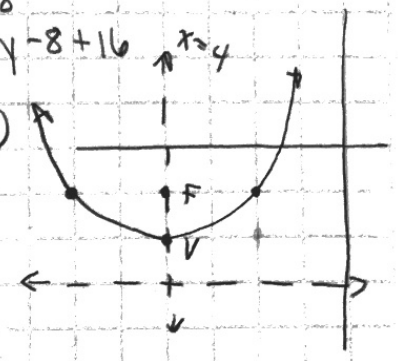
5. $(y+3)^2 = 8(x+1)$
vertex $(-1, -3)$
opens right
 $p = 2$ LR = 8
focus $(1, -3)$
directrix $x = -3$
AOS $y = -3$



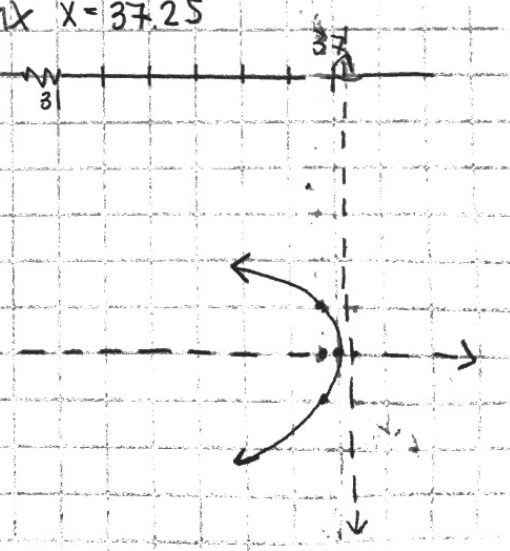
6. $(x-3)^2 = -(y+1)$
center $(3, -1)$
opens down
 $p = 1/4$ LR = 1
focus $(3, -1.25)$
 $(3, -5/4)$
directrix $y = -3/4$
AOS $x = 3$



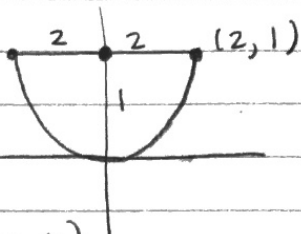
7. $x^2 + 8x = 4y - 8$
 $x^2 + 8x + 16 = 4y - 8 + 16$
 $(x+4)^2 = 4y + 8$
 $(x+4)^2 = 4(y+2)$
opens up
center $(-4, -2)$
 $p = 1$, LR = 4
focus $(-4, 1)$
AOS $x = 4$
directrix $y = -3$



8. $y^2 + 12y = -x + 1$
 $y^2 + 12y + 36 = -x + 1 + 36$
 $(y+6)^2 = -x + 37$
 $(y+6)^2 = -1(x-37)$
vertex $(37, -6)$
opens left
 $p = 1/4$ LR = 1
focus $(36.75, -6)$
AOS $x = -6$
directrix $x = 37.25$



9. parabola
diameter 4
depth 1
? focus



$$(x-h)^2 = 4p(y-k)$$

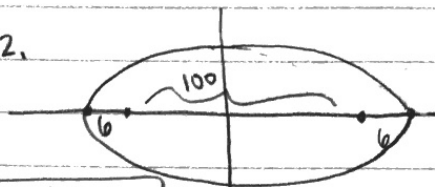
$$x^2 = 4py \quad (2,1)$$

$$2^2 = 4p(1)$$

$$p = 1$$

1 inch

12.



length 112

$$a = 56 \quad c = 50$$

$$c^2 = a^2 - b^2$$

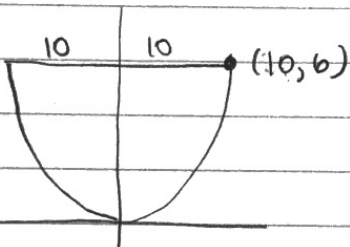
$$50^2 = 56^2 - b^2$$

$$2500 = 3136 - b^2$$

$$b = \sqrt{636} \approx 25.22 \text{ ft}$$

25.22 ft high
at center

10. parabola
diameter 20
depth 6
? focus



$$x^2 = 4py$$

$$10^2 = 4p(6)$$

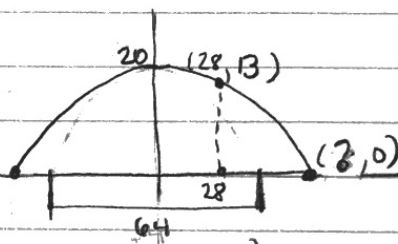
$$100 = 24p$$

$$\frac{100}{24} = p$$

$$4.17 = p$$

4.17 feet

13.



highway width = $4(12) + 8 + 2(4) = 64$
center (0,0), $b = 20$, ? a

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\frac{x^2}{a^2} + \frac{y^2}{400} = 1$$

$$\frac{28^2}{a^2} + \frac{13^2}{400} = 1$$

$$\frac{784}{a^2} + \frac{169}{400} = 1$$

$$\frac{784}{a^2} = \frac{231}{400}$$

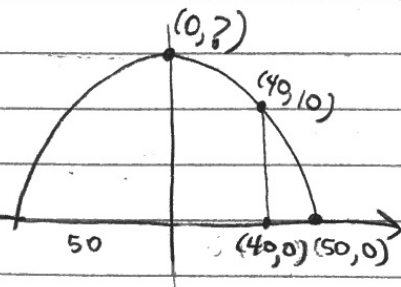
$$231a^2 = 400 \cdot 784$$

$$a^2 = 1357.576$$

$$a \approx 36.845$$

span: 73.09 ft

11. parabola
width 100ft
height 40ft
center (0,3)



$$(x-h)^2 = -4p(y-k)$$

$$x^2 = -4p(y-k)$$

$$(50,0)$$

$$(49,10)$$

$$50^2 = -4p(0-k)$$

$$49^2 = -4p(10-k)$$

$$2500 = 4pk$$

$$1600 = -4p(10-k)$$

$$\frac{2500}{k} = 4p$$

$$\frac{-1600}{10-k} = 4p$$

$$\frac{2500}{k} = \frac{-1600}{10-k}$$

$$\rightarrow 25000 = 900k$$

$$k = 27.778$$

27.78 ft

(0, 27.78)

$$2500(10-k) = -1600k$$

$$25000 - 2500k = -1600k$$