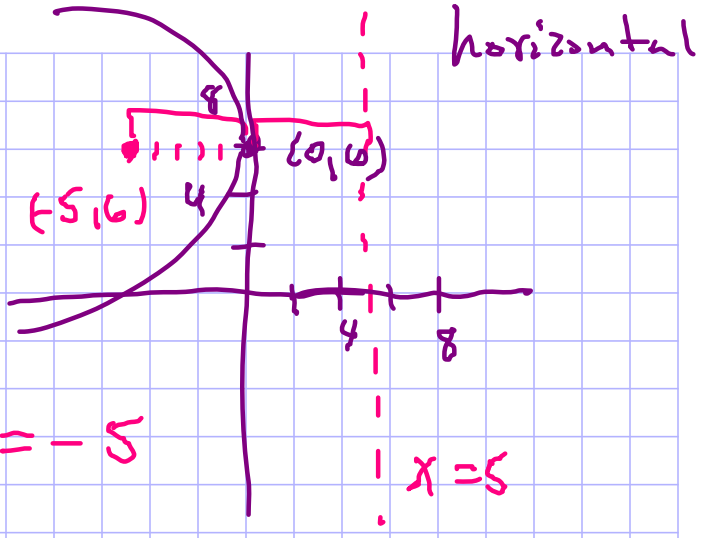
12.5 #18-36m3, 37

18. vertex $(0,6)$

directrix: $x = 5$



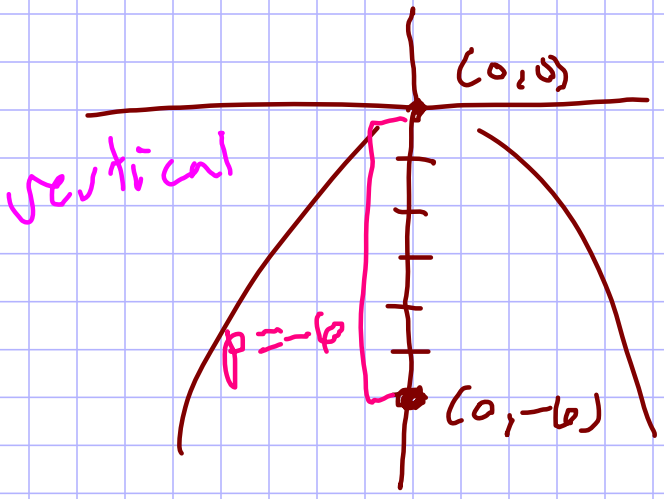
$(y-k)^2 = 4p(x-h)$

$(y-6)^2 = 4(-5)(x-0)$

$\boxed{(y-6)^2 = -20x}$

21. vertex $(0,0)$

focus $(0,-6)$



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

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

$\boxed{x^2 = -24y}$

24. $x-2=\frac{1}{2}(y+1)^2$ horizontal (focus on "x")

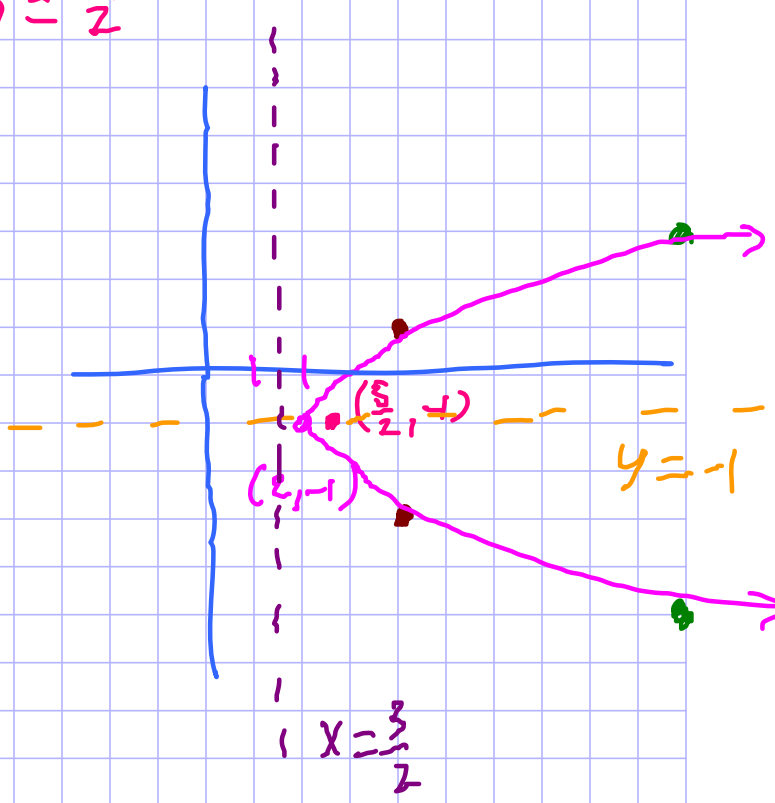
$(y+1)^2=2(x-2)$ $4p=2$, $p=\frac{1}{2}$

vertex $(2,-1)$

focus $(h+p,k)=(\frac{5}{2},-1)$

directrix: $x=h-p=\frac{3}{2}$

a.o.s. $y=-1$



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

$4=2(x-2)$

$2=x-2$

$4=x$

x	y
10	3
4	1
2	-1
4	-3
10	-5

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

$16=2(x-2)$

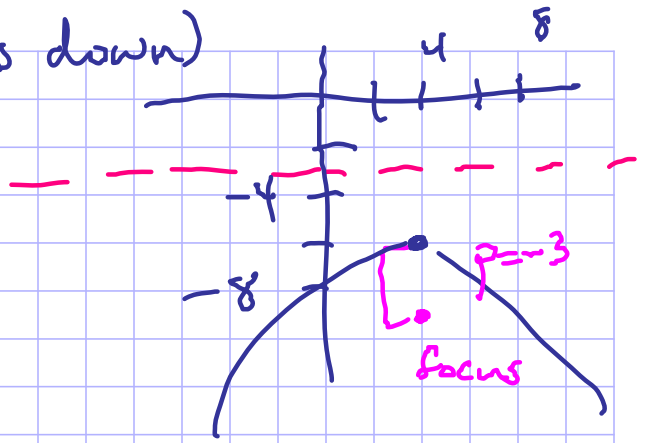
$8=x-2$

$10=x$

27. vertex $(2,-6)$

directrix $y=-3$

(opens down)



vertical

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

$$(x-2)^2 = 4(-3)(y-(-6))$$

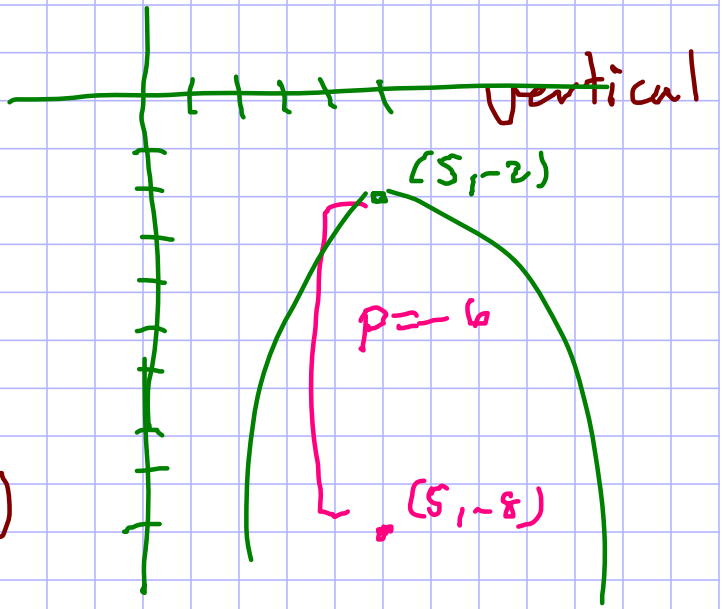
$$\boxed{(x-2)^2 = -12(y+6)}$$

Domain: all $\mathbb{R}$

Range: all $\mathbb{R}$ $y \leq -6$

30. vertex $(5,-2)$

focus $(5,-8)$



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

$$(x-5)^2 = 4(-6)(y-(-2))$$

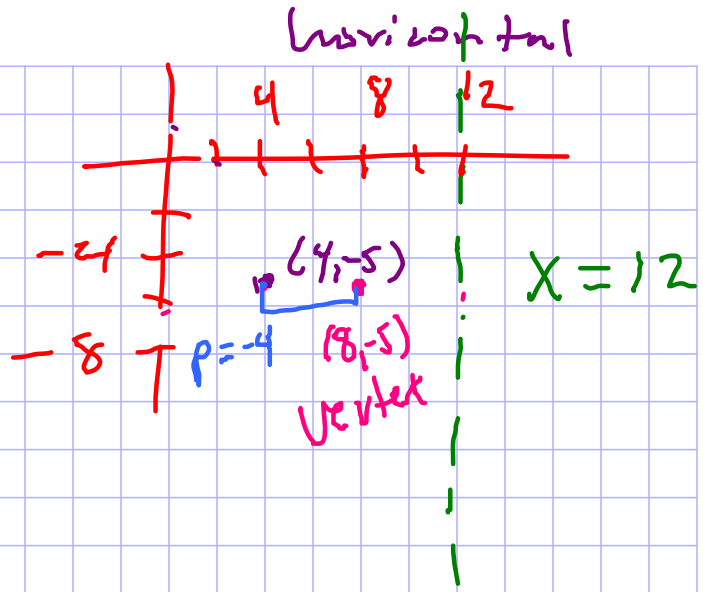
$$\boxed{(x-5)^2 = -24(y+2)}$$

D: all $\mathbb{R}$

R: all $\mathbb{R}$ $y \leq -2$

33. focus $(4,-5)$

directrix: $x = 12$



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

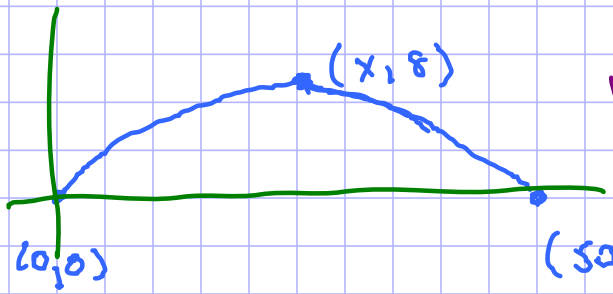
$(y-(-5))^2 = 4(-4)(x-8)$

$$\boxed{(y+5)^2 = -16(x-8)}$$

D: all $\mathbb{R}$ $x \le 8$

R: all $\mathbb{R}$

36.



vertical

a) vertex $= \left(\frac{0+50}{2}, 8\right)$

vertex $= (25, 8)$

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

$(x-25)^2 = 4p(y-8)$

$(0-25)^2 = 4p(0-8)$

$625 = 4p(-8)$

$\frac{-625}{8} = 4p$

$$\boxed{(x-25)^2 = \frac{-625}{8}(y-8)}$$

b) $\frac{10 \text{ ft}}{3 \text{ ft}} \left| \frac{1 \text{ yrd}}{} \right. = \frac{10}{3}$ yrds

when $x = 40$, is $y \geq \frac{10}{3}$

$(40-25)^2 = -\frac{625}{8}(y-8)$

$\frac{-8}{625} \cdot 225 = -\frac{625}{8}(y-8) \cdot \frac{-8}{625}$

$-2.88 = y - 8$

$5.12 = y$

yes; at 40 yards the ball will be 5.12 yrds in the air which is higher than $\frac{10}{3}$ yrds.

37. $y = -\frac{1}{532}(x+96)^2 + 174$

$-532(y-174) = (x+96)^2$ vertical

$4p = -532$

$p = -133$

a) focus $(h, k+p)$

sun is at $(-96, 41)$

b) distance btwn focus & vertex

$$d = \sqrt{(-96-(-96))^2 + (41-174)^2}$$

$$d = \sqrt{(-133)^2} = \boxed{133 \text{ million miles}}$$

c) the comet is closest to the sun at the vertex $(-96, 174)$

12.6 # 22, 26, 30

22. $x^2 + 20x - 4y + 100 = 0$

vertical parabola

$(x^2 + 20x + \underline{100}) = 4y - 100$
$+100$

$\left(\frac{20}{2}\right)^2 = (10)^2 = 100$

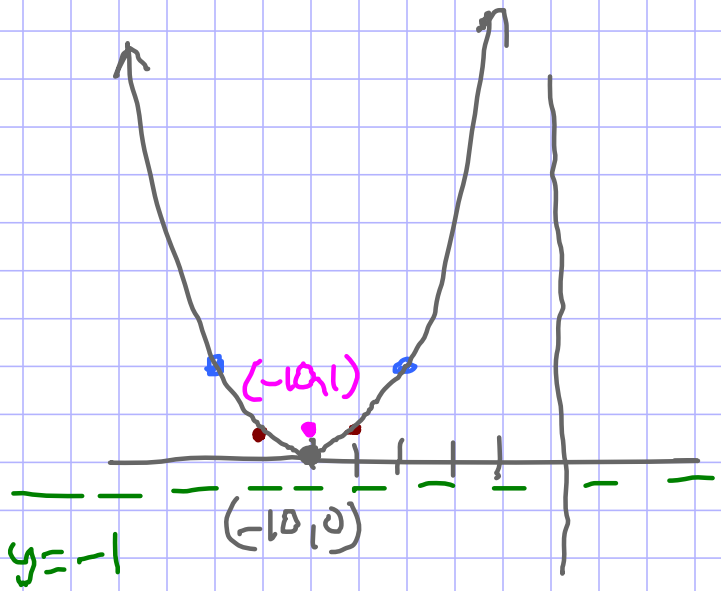
$(x+10)^2 = 4y$

vertex $(-10, 0)$

$4p = 4$
$p = 1$

focus $(-10, 1)$

directrix $y = -1$



x	y
-6	4
-8	1
-10	0
-12	1
-14	4

$(-8+10)^2 = 4y$

$4 = 4y$

$1 = y$

$(-6+10)^2 = 4y$

$16 = 4y$

$4 = y$

vertical parabola

26. $x^2 - 2x - 20y - 79 = 0$

$(x^2 - 2x + \underline{1}) = 20y + 79 + 1$

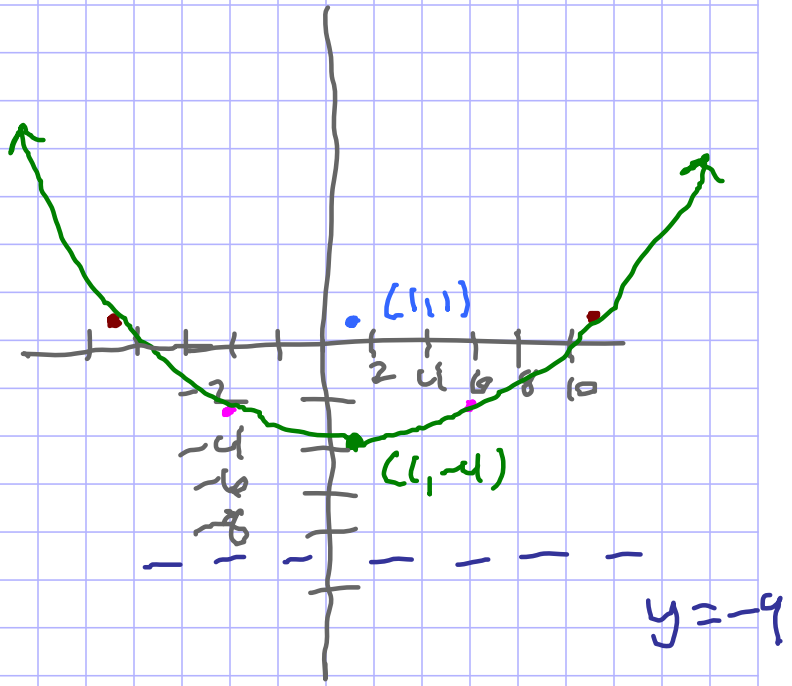
$(x-1)^2 = 20y + 80$

$(x-1)^2 = 20(y+4)$

vertex $(1, -4)$

focus $(1, 1)$ $4p = 20$, $p = 5$

directrix: $y = -9$



11	1
6	-2.75
1	-4
-4	-2.75
-9	1

$(6-1)^2 = 20(y+4)$

$25 = 20(y+4)$

$1.25 = y+4$

$-2.75 = y$

$(11-1)^2 = 20(y+4)$

$100 = 20(y+4)$

$5 = y+4$

$1 = y$

30.

$y^2 + 6x + 12y - 6 = 0$

horizontal parabola

$y^2 + 12y + \underline{36} = -6x + 6 + 36$ $\quad \left(\frac{12}{2}\right)^2 = (6)^2 = 36$

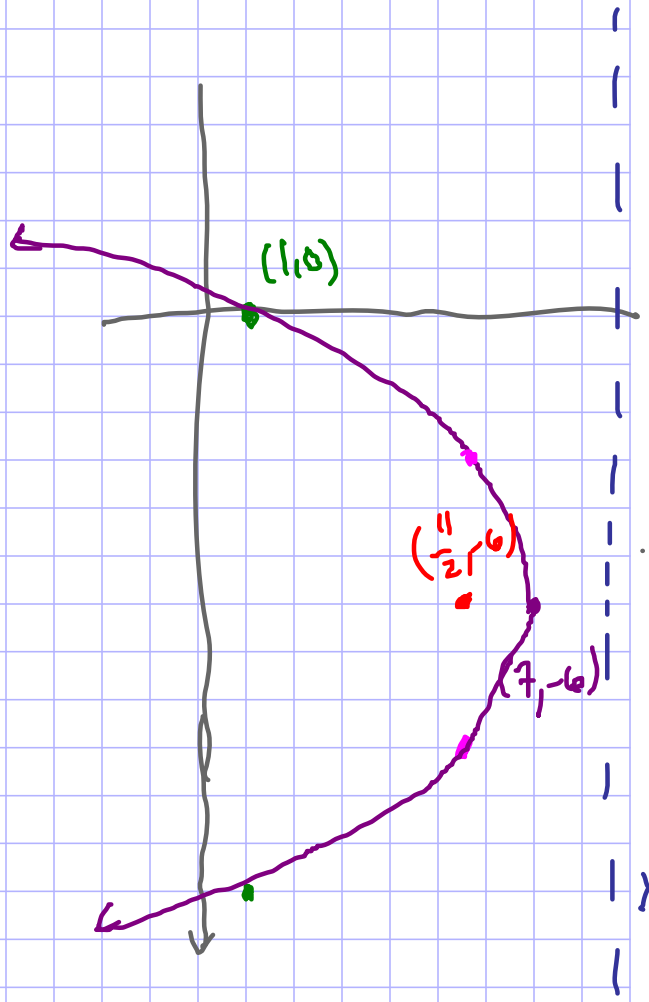
$(y+6)^2 = -6x + 42$

$(y+6)^2 = -6(x-7)$

vertex $(7, -6)$

focus $\left(\frac{11}{2}, -6\right)$ $\quad 4p = -6$, $p = -3/2$

directrix: $x = \frac{17}{2}$



x	y
1	0
11/2	-3
7	-6
11/2	-9
1	-12

$(-3+6)^2 = -6(x-7)$

$9 = -6(x-7)$

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

$\frac{11}{2} = x$

$(0+6)^2 = -6(x-7)$

$36 = -6(x-7)$

$-6 = x - 7$

$1 = x$