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# 1-13, 43, 45, 47, 53

1. $\frac{(x+2)^2}{9} + \frac{y^2}{49} = 1$ $a^2$ under y  $a=7$ $b=3$

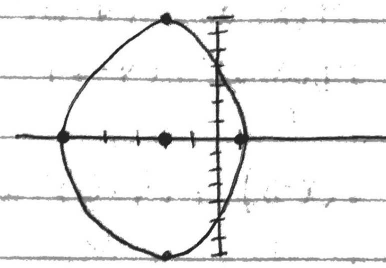
center = $(-2,0)$

vertices: $(-2, 0+7)$ and $(-2, 0-7)$

$(-2, 7)$ $(-2, -7)$

co-vertices: $(-2+3, 0)$ and $(-2-3, 0)$

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



2. $\frac{(x+4)^2}{9} + \frac{(y+3)^2}{4} = 1$ $a^2$ under x  $a=3$ $b=2$

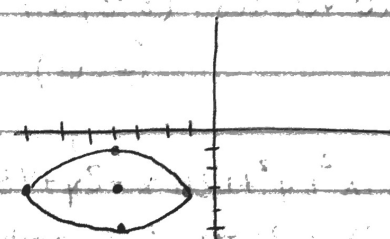
center = $(-4,-3)$

vertices: $(-4+3, -3)$ and $(-4-3, -3)$

$(-1, -3)$ $(-7, -3)$

co-vertices: $(-4, -3+2)$ and $(-4, -3-2)$

$(-4, -1)$ $(-4, -5)$



3. $x^2 + 9y^2 - 14x + 36y + 49 = 0$

$x^2 - 14x + 9y^2 + 36y = -49$

$x^2 - 14x + 9(y^2 + 4y) = -49$

$(x-7)^2 + 9(y+2)^2 = -49 + 49 + 9(4)$

$\frac{(x-7)^2}{36} + \frac{9(y+2)^2}{36} = \frac{36}{36}$

$\frac{(x-7)^2}{36} + \frac{(y+2)^2}{4} = 1$ $a^2$ under x  $a=6$ $b=2$

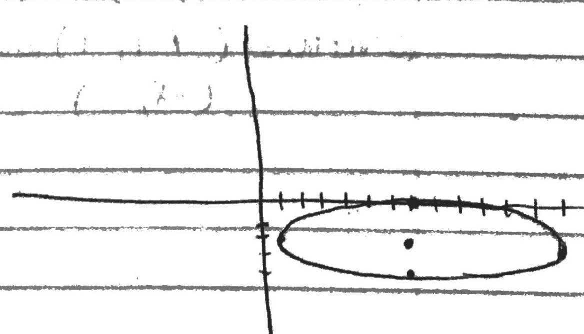
center = $(7,-2)$

vertices: $(7+6, -2)$ and $(7-6, -2)$

$(13, -2)$ $(1, -2)$

co-vertices: $(7, -2+2)$ and $(7, -2-2)$

$(7, 0)$ $(7, -4)$



4. $4x^2+y^2-64x-12y+276=0$

$4x^2-64x+y^2-12y=-276$

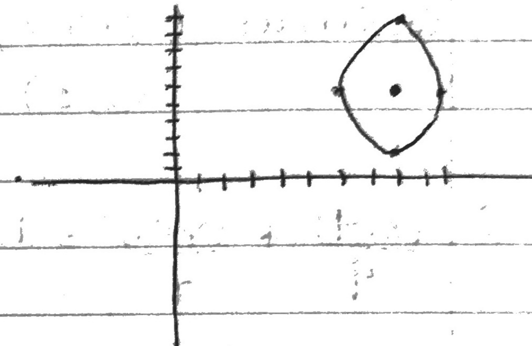
$4(x^2-16x)+y^2-12y=-276$

$4(x-8)^2+(y-6)^2=-276+4(64)+36$

$\dfrac{4(x-8)^2}{16}+\dfrac{(y-6)^2}{16}=\dfrac{16}{16}$

$\dfrac{(x-8)^2}{4}+\dfrac{(y-6)^2}{16}=1$ $a^2$ under y

$a=4$
$b=2$



center $=(8,6)$

vertices: $(8,6+4)$ and $(8,6-4)$

$(8,10)$ $(8,2)$

co-vertices: $(8-2,6)$ and $(8+2,6)$

$(6,6)$ $(10,6)$

5. $9x^2+y^2+126x+2y+433=0$

$9x^2+126x+y^2+2y=-433$

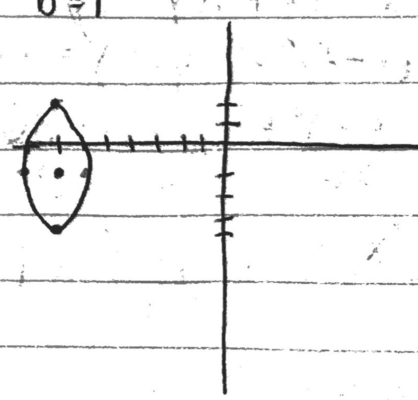
$9(x^2+14x)+y^2+2y=-433$

$9(x+7)^2+(y+1)^2=-433+9(49)+1$

$\dfrac{9(x+7)^2}{9}+\dfrac{(y+1)^2}{9}=\dfrac{9}{9}$

$\dfrac{(x+7)^2}{1}+\dfrac{(y+1)^2}{9}=1$ $a^2$ under y

$a=3$
$b=1$



center $=(-7,-1)$

vertices $=(-7,-1+3)$ and $(-7,-1-3)$

$(-7,2)$ $(-7,-4)$

co-vertices: $(-7-1,-1)$ and $(-7+1,-1)$

$(-8,-1)$ $(-6,-1)$

6. $x^2+25y^2-12x-100y+111=0$

$x^2-12x+25y^2-100y=-111$

$x^2-12x+25(y^2-4y)=-111$

$(x-6)^2+25(y-2)^2=-111+36+25(4)$

$\frac{(x-6)^2}{25}+\frac{25(y-2)^2}{25}=\frac{25}{25}$

$\frac{(x-6)^2}{25}+\frac{(y-2)^2}{1}=1$ $a^2$ under x  $a=5$, $b=1$

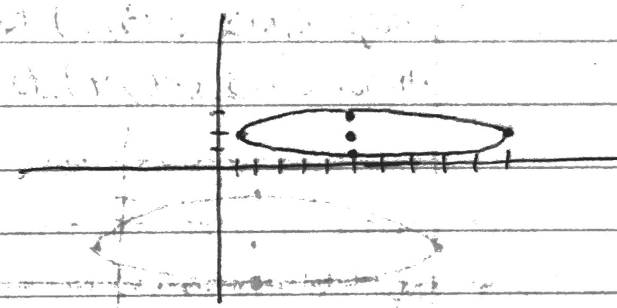
center: $(6,2)$

vertices: $(6+5,2)$ and $(6-5,2)$

$(11,2)$ $(1,2)$

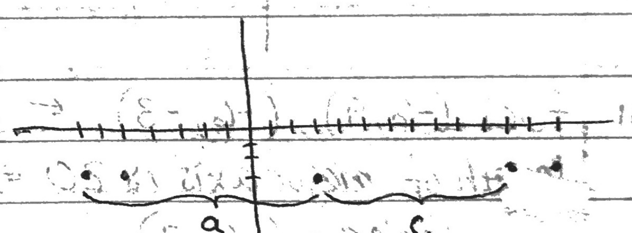
co-vertices: $(6,2+1)$ and $(6,2-1)$

$(6,3)$ $(6,1)$



7. vertices: $(-7,-3)$, $(13,-3)$

foci: $(-5,-3)$, $(11,-3)$




$\frac{(x-3)^2}{100}+\frac{(y+3)^2}{36}=1$

center: $(3,-3)$

$c=8$

$a=10$ (under x)

$c=\sqrt{a^2-b^2}$

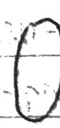
$8=\sqrt{100-b^2}$

$64=100-b^2$

$b^2=36$

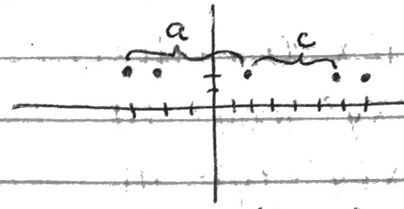
8. vertices: $(4,3)$, $(4,-9)$ ← length of major axis = 12; $a=6$

length of minor axis = 8 ← $b=4$

 $a^2$ under y

Center = $(4,-3)$ $\frac{(x-4)^2}{16}+\frac{(y+3)^2}{36}=1$

9. vertices: (7,2), (-3,2)
foci: (6, 2), (-2, 2)




$a^2$ under x

$$\frac{(x-2)^2}{25}+\frac{(y-2)^2}{9}=1$$

center: (2, 2)

a = 5

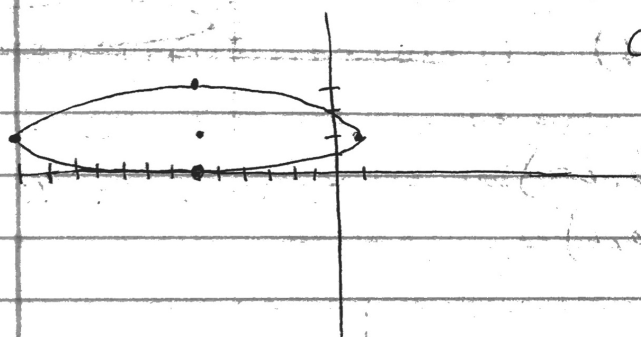
c = 4

$4=\sqrt{25-b^2}$

$16=25-b^2$

$b^2=9$

10. major axis (-13,2) to (1,2) ← a = 7   $a^2$ under x
minor axis (-6,4) to (-6,0) ← b = 2



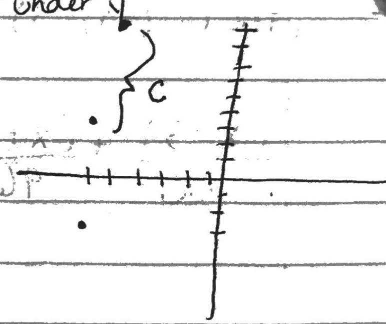
center = (6, 1)

$$\frac{(x-6)^2}{49}+\frac{(y-1)^2}{4}=1$$

11. foci (-6,9), (-6,-3) ← c = 6

$a^2$ under y

length of major axis is 20 ← a = 10




center = (-6, 3)

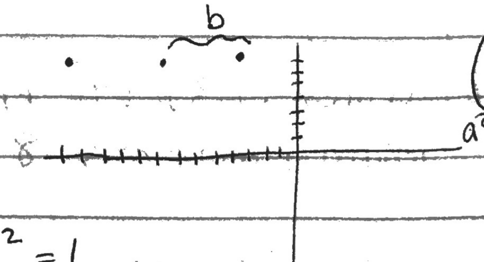
$6=\sqrt{100-b^2}$

$36=100-b^2$

$b^2=64$

$$\frac{(x+6)^2}{64}+\frac{(y-3)^2}{100}=1$$

12. co-vertices (-13,7), (-3,7) ← b = 5
length of major axis is 16 ← a = 8




$a^2$ under y

center = (8, 7)

$$\frac{(x-8)^2}{25}+\frac{(y-7)^2}{64}=1$$

 $a^2$ under x

13. foci $(-10,8), (14,8)$ $\leftarrow c = 12$  center $= (2,8)$

length of major axis is 30 $\leftarrow a = 15$

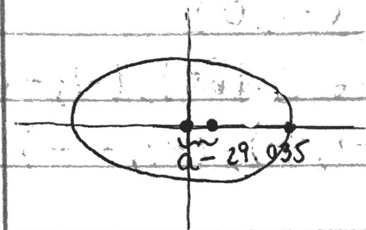
$12 = \sqrt{225 - b^2}$

$144 = 225 - b^2$

$b^2 = 81$

$$\frac{(x-2)^2}{225} + \frac{(y+8)^2}{81} = 1$$

43.




870,000

a) major axis length $= 43.4 + 0.87 + 28.6 = 72.87$ $(a = 36.435)$

distance from focus to vertex $= \frac{1}{2}(0.87) + 28.6 = 29.035$

$c = \sqrt{a^2 - b^2}$  $c = 36.435 - 29.035 = 7.4$

$7.4 = \sqrt{1327.509225 - b^2}$

$54.76 = 1327.509225 - b^2$

$b^2 = 1272.75$

$b = 35.67$  length of minor axis $= 2b$

$= 71.35$ million miles

b) $e = \frac{c}{a} = \frac{7.4}{36.435} = 0.203$

45. $\frac{x^2}{100} + \frac{(y+6)^2}{25} = 1$  center $= (0,-6)$

$a^2$  $b^2$  vertices: $(10,-6), (-10,-6)$

foci: $(5\sqrt{3}, -6), (-5\sqrt{3}, -6)$

$c = \sqrt{100 - 25}$

$c = \sqrt{75}$

$c = 5\sqrt{3}$

47. $65x^2+16y^2+130x-975=0$

$65x^2+130x+16y^2=975$

$65(x^2+2x)+16y^2=975$

$65(x+1)^2+16(y^2)=975+65(1)$

$\frac{65(x+1)^2}{1040}+\frac{16(y^2)}{1040}=\frac{1040}{1040}$

$\frac{(x+1)^2}{16_{b^2}}+\frac{y^2}{65_{a^2}}=1$

center = $(-1,0)$

vertices: $(-1,\sqrt{65}),(-1,-\sqrt{65})$

foci: $(-1,7),(-1,-7)$

$c=\sqrt{65-16}$

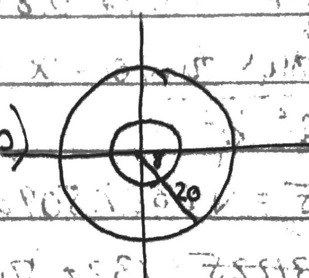
$c=\sqrt{49}=7$

53. a) $x^2+y^2=64$ (current)

$x^2+y^2=(20+8)^2$

$x^2+y^2=784$ (at the city)

b)




c)

| day | radius |
|---|---|
| 0 | 8 |
| 1 | 12 |
| 2 | 16 |
| 3 | 20 |
| 4 | 24 |
| 5 | 28 |