Pre-Calculus A
Circles and Ellipses Quiz Review

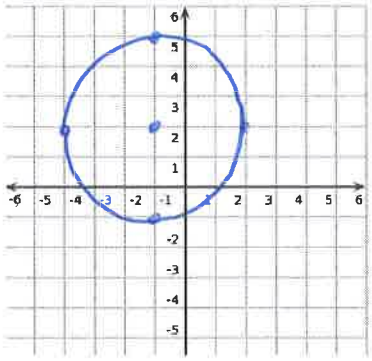
Name : Key
Date : _____ Period : ___

1. Identify the center and radius and graph the conic section given $(x+1)^2+(y-2)^2=9$

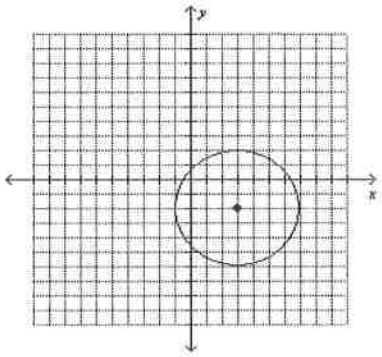
Center $(-1,2)$

radius : $r^2=9$

$r=3$



2. Please write the equation of the circle from the following graph.



center $(\overset{h}{3},\overset{k}{-2})$; radius : 4

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

$\boxed{(x-3)^2+(y+2)^2=16}$

3. Write the equation of the circle with center $(\overset{h}{-5},\overset{k}{4})$ and one half of the length of the diameter is $7\sqrt{2}$. $r=7\sqrt{2}$

$(x--5)^2+(y-4)^2=(7\sqrt{2})^2$

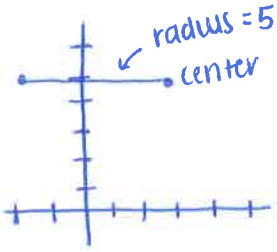
$(x+5)^2+(y-4)^2=(49\cdot 2)$

$\boxed{(x+5)^2+(y-4)^2=98}$

4. Find the standard form of the equation of the circle given the center at (3, 5) and containing the point (-2, 5). radius = 5 ; center $(\overset{h}{3},\overset{k}{5})$

$(x-3)^2+(y-5)^2=5^2$

$\boxed{(x-3)^2+(y-5)^2=25}$



5. Find the standard form of the equation of the circle given the center at $(\overset{h}{-4},\overset{k}{8})$ and containing the point (-1, 5).
x y

$(x-h)^2+(y-k)^2=r^2$

$(-4--1)^2+(8-5)^2=r^2$

$(-4+1)^2+(8-5)^2=r^2$

$(-3)^2+(3)^2=r^2$

$9+9=r^2$

$18=r^2$

$(x--4)^2+(y-8)^2=18$

$\boxed{(x+4)^2+(y-8)^2=18}$

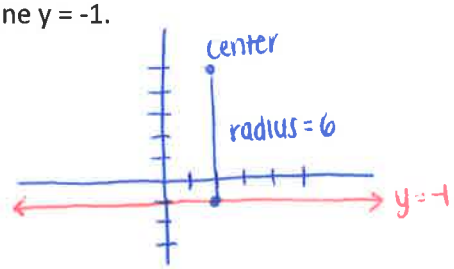
6. Write the equation of the circle with center at (2, 5) and tangent to the line y = -1.

center (2,5)

radius = 6

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

$\boxed{(x-2)^2+(y-5)^2=36}$

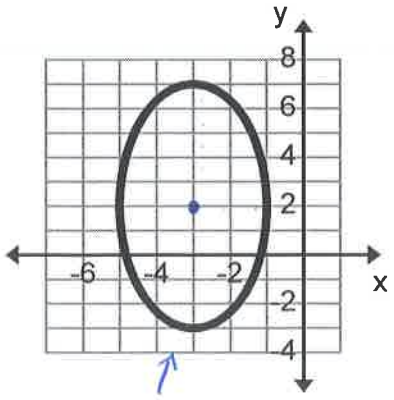


7. Write the equation of the circle with center on the line y = x and tangent to the x-axis at 5.

8. Find the x- and y- intercepts of the graph of the circle given by the equation $(x+2)^2+(y-1)^2=10$.

9. Write the equation of an ellipse with foci of $(3,4)$ and $(3,-5)$, and minor axis endpoints of $(0,-1)$ and $(6,-1)$.

10. Write the standard form of the equation for the following ellipse



center (-3,2)

a = 5

b = 2

$\frac{(x--3)^2}{2^2}+\frac{(y-2)^2}{5^2}=1$

$\boxed{\frac{(x+3)^2}{4}+\frac{(y-2)^2}{25}=1}$

major axis is vertical

so a^2 goes under $(y+k)^2$

11. Given vertices (4, 3) and (4, 9) and focus point (4, 8), please write the standard form of the equation of the ellipse.

12. Given foci (5, 1) and (-1, 1) and length of major axis 8, please write the standard form of the equation of the ellipse.

13. Given the equation $\frac{(x-3)^2}{49}+\frac{(y-4)^2}{81}=1$, please identify the center of the ellipse, and the a, b, and c values.

b^2 a^2

Center (3,4)

$a^2=81 \Rightarrow a=9$

$b^2=49 \Rightarrow b=7$

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

$c^2=81-49$

$c^2=32$

$c=\sqrt{32} \Rightarrow c=4\sqrt{2}$

14. Given the equation $\frac{(x+1)^2}{49}+\frac{(y+6)^2}{21}=1$, please identify the center of the ellipse, and the a, b, and c values.

a^2 b^2

Center (-1,-6)

$a^2=49 \Rightarrow a=7$

$b^2=21 \Rightarrow b=\sqrt{21}$

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

$c^2=49-21$

$c^2=28$

$c=\sqrt{28} \Rightarrow c=2\sqrt{7}$

15. Given the equation $16x^2+25y^2=400$, please write the equation in standard form, identify the center, and the a, b, and c values.

$\frac{16x^2}{400}+\frac{25y^2}{400}=\frac{400}{400}$ ← get RHS equal to 0 so divide by 400

$\frac{x^2}{25}+\frac{y^2}{16}=1$

a^2 b^2

Center (0,0)

$a^2=25 \Rightarrow a=5$

$b^2=16 \Rightarrow b=4$

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

$c^2=25-16$

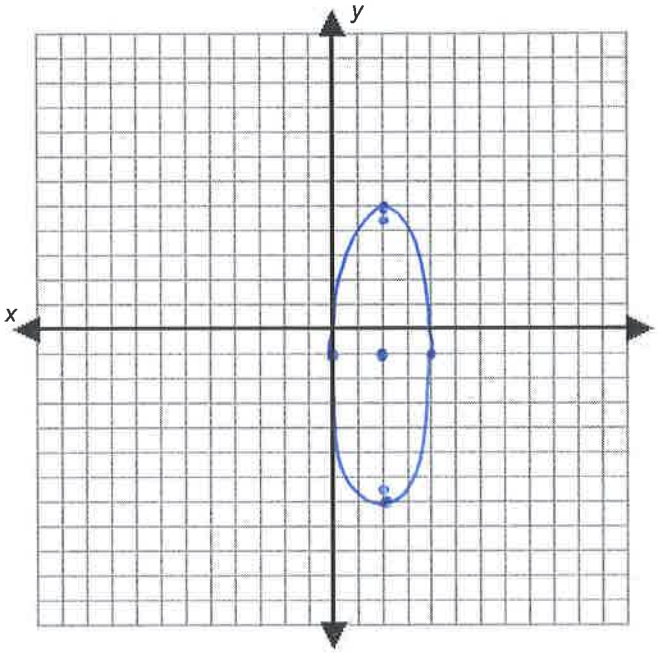
$c^2=9$

$c=3$

16. Given the equation $\frac{(x-2)^2}{4}+\frac{(y+1)^2}{36}=1$, please identify the center, the a, b, and c values, and then graph the ellipse.

b^2 a^2

major axis is vertical



center $(2,-1)$

$a^2 = 36 \Rightarrow a = 6$

$b^2 = 4 \Rightarrow b = 2$

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

$c^2 = 36 - 4$

$c^2 = 32$

$c = \sqrt{32} \approx 5.7$

$c = 4\sqrt{2}$

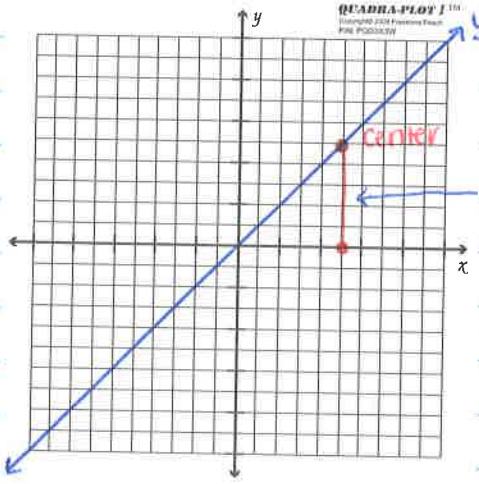
Applications:

17. An appliance store will provide free delivery up to 100 miles from the store. If a house is located 75 miles east and 70 miles north of the store, will this customer receive free delivery?

18. A figure skater practices skating figure eights, which are formed by etching two externally tangent circles in the ice. Write equations for the circles in a figure eight if each is 8 feet in diameter, the circles intersect at the origin, and the centers of the circles are on the y-axis.

19. A semielliptical arch over a tunnel for a road through a mountain has a major axis of 100 feet and a height at the center of 40 feet. Sketch this arch with the center of the road entering the tunnel at the origin. Identify the coordinates of the known points, and then find the equation of the semielliptical arch over the tunnel.

#7



center (5,5)

$(x-5)^2+(y-5)^2=5^2$

$\boxed{(x-5)^2+(y-5)^2=25}$

#8 To find x-int, plug 0 in for y and solve for x:

$(x+2)^2+(0-1)^2=10$

$(x+2)^2+1=10$

$(x+2)^2=9$

$x+2=\pm 3$

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

$x=1 \quad x=-5$

$\boxed{(1,0)} \quad \boxed{(-5,0)}$

To find y-int, plug 0 in for x and solve for y:

$(0+2)^2+(y-1)^2=10$

$4+(y-1)^2=10$

$(y-1)^2=6$

$y-1=\pm\sqrt{6}$

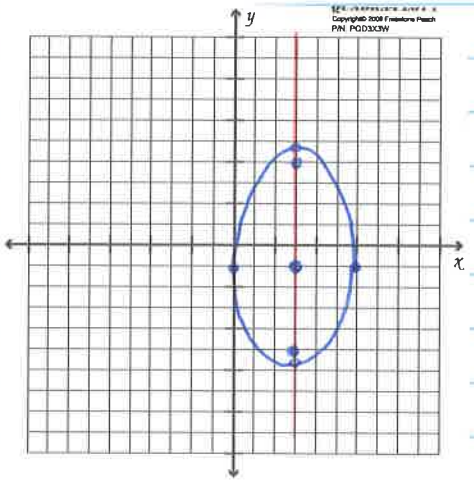
$y-1=\sqrt{6} \quad y-1=-\sqrt{6}$

$y=1+\sqrt{6} \quad y=1-\sqrt{6}$

$y=3.45 \quad y=-1.45$

$\boxed{(0,3.45)} \quad \boxed{(0,-1.45)}$

#9



foci (3,4) and (3,-5) ← major axis is vertical

center: halfway b/t foci at $\overset{h}{(3}, \overset{k}{-1})$

$c = 5$ (from center to a focus)

$b = 3$ (from center to endpoint of minor axis)

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

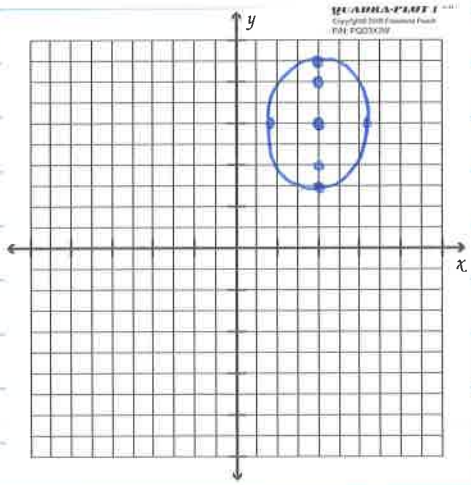
$25 = a^2 - 9$

$34 = a^2$

$a \approx 5.83$

Equation: $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1 \Rightarrow \frac{(x-3)^2}{3^2} + \frac{(y--1)^2}{34} = 1 \Rightarrow \boxed{\frac{(x-3)^2}{9} + \frac{(y+1)^2}{34} = 1}$

#11



Vertices (4,3) and (4,9) ← major axis is vertical

center: halfway b/t vertices at (4,6)

$c = 2$ (from center to focus)

$a = 3$ (from center to vertex)

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

$4 = 9 - b^2$

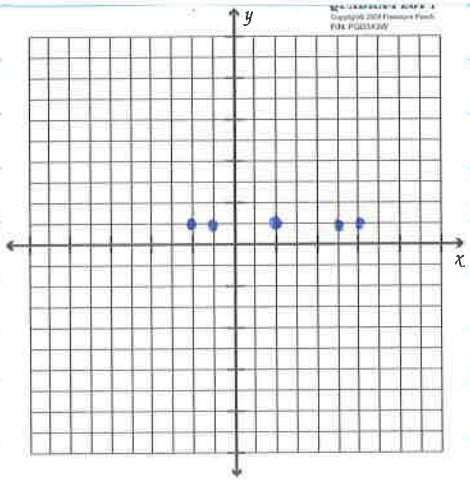
$-5 = -b^2$

$5 = b^2$

$b \approx 2.2$

Equation: $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1 \Rightarrow \frac{(x-4)^2}{5} + \frac{(y-6)^2}{3^2} = 1 \Rightarrow \boxed{\frac{(x-4)^2}{5} + \frac{(y-6)^2}{9} = 1}$

#12



Foci (5,1) and (-1,1) ← major axis is horizontal

center: halfway b/t foci at (2,1)

major axis = 8

$2a = 8$

$a = 4$

$c = 3$ ← distance from center to a focus

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

$9 = 16 - b^2$

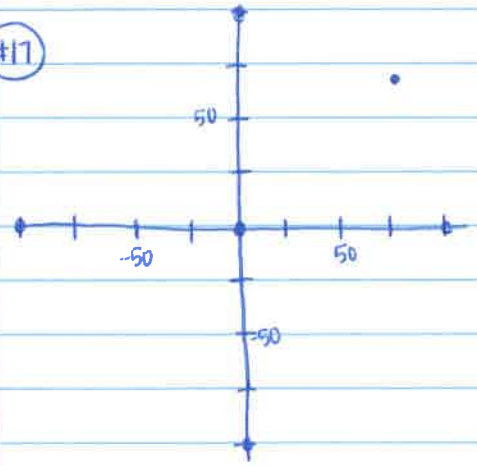
$-7 = -b^2$

$b^2 = 7$

$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$

$\Rightarrow \frac{(x-2)^2}{4^2} + \frac{(y-1)^2}{7} = 1 \Rightarrow \boxed{\frac{(x-2)^2}{16} + \frac{(y-1)^2}{7} = 1}$

#17



hk

center (0,0)

radius = 100

75 mi east, 70 mi north ⇒ (75,70)

xy

$(x-h)^2 + (y-k)^2 = r^2$

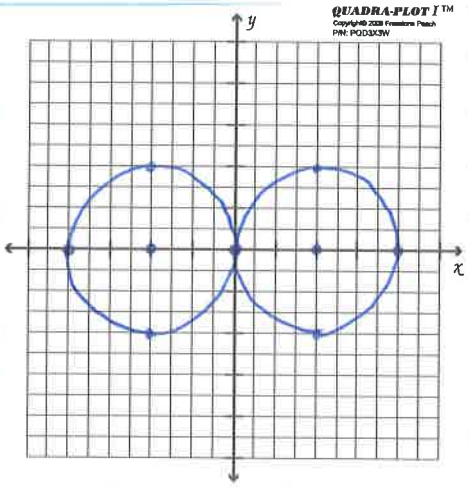
$(75-0)^2 + (70-0)^2 = 100^2$

$5625 + 4900 = 10000$

$10525 \neq 10000$

No, customer will not get free delivery

#18



diameter of each circle = 8 ft

radius of each circle = 4ft

→ If circles are tangent at the origin, the centers of the circles will be (4,0) and (-4,0)

Left circle: center (-4,0), r = 4

$(x--4)^2+(y-0)^2=4^2$

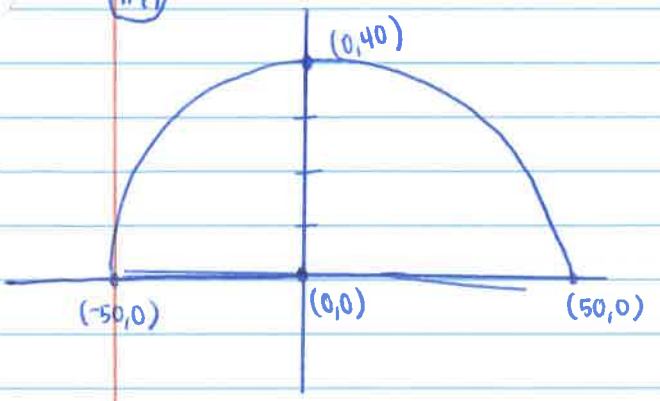
$\boxed{(x+4)^2+y^2=16}$

Right circle: center (4,0); r = 4

$(x-4)^2+(y-0)^2=4^2$

$\boxed{(x-4)^2+y^2=16}$

#19



major axis = 100 ft

$2a=100$

$a=50$

height at center = b-value

$40=b$

$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$

$\frac{(x-0)^2}{50^2}+\frac{(y-0)^2}{40^2}=1$

$\boxed{\frac{x^2}{2500}+\frac{y^2}{1600}=1}$