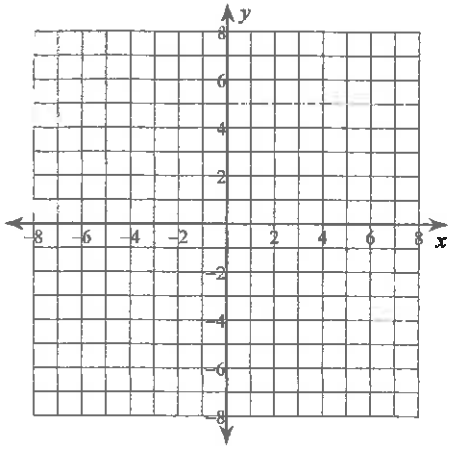
MATH 5 SN

Name_____

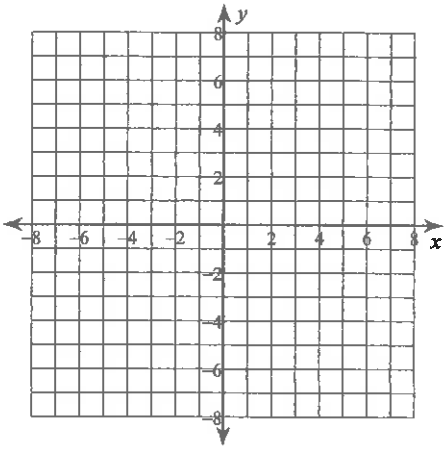
PRETEST - CIRCLES and ELLIPSES

Identify the center and radius of each. Then sketch the graph.

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

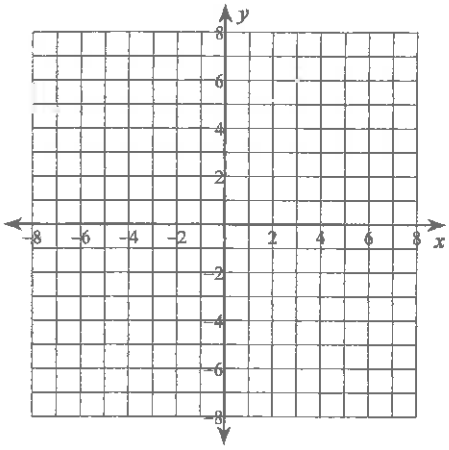


2) $x^2+y^2+6x+8y+16=0$

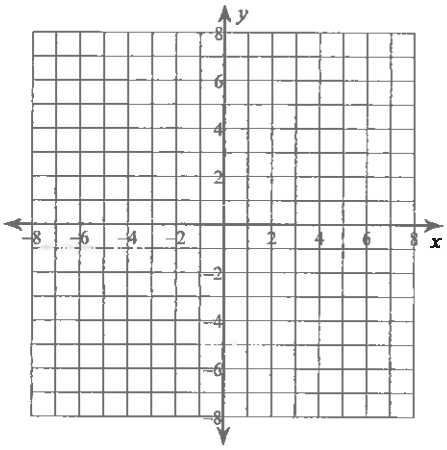


Identify the center, vertices, co-vertices, foci, length of the major axis, and length of the minor axis of each. Then sketch the graph.

3) $\dfrac{(x+3)^2}{9} + \dfrac{(y+1)^2}{4} = 1$



4) $9x^2 + 4y^2 - 36x + 16y + 16 = 0$



Solve each system of equations.

5) $x^2 + y^2 + 15x + 3y - 4 = 0$
$-3x + y + 4 = 0$

6) $3x^2 + 2y^2 - 3x - 31y - 36 = 0$
$x + y + 3 = 0$

(7) Given $x^2+y^2-625=0$

Find the equation of the tangent line at $x=-7$ in general form.

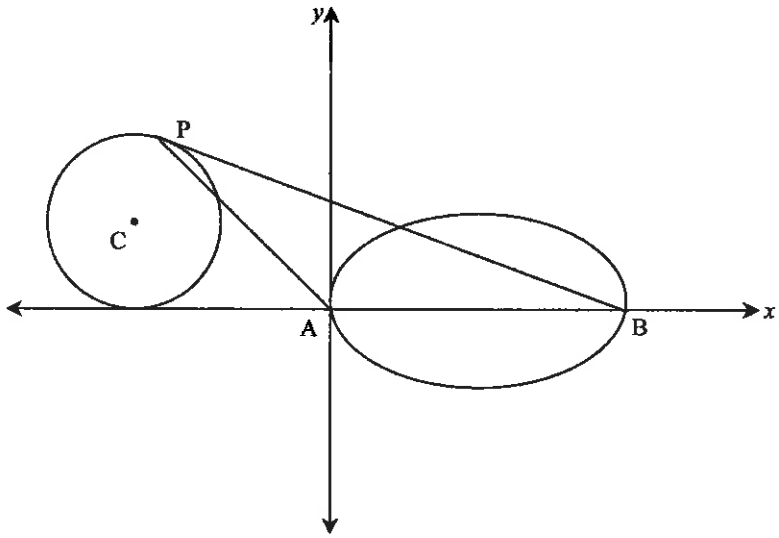
(8) Sketch

$$\frac{(x-1)^2}{16}+\frac{(y)^2}{9}\geq 1$$

(9) $x^2+y^2<49$

10

~~28~~ A team of landscape architects is hired to design the layout of two garden areas, one circular and the other elliptical in shape, as in the diagram below.



The equation of the circle is $(x+5)^2+(y-3)^2=9$.

The equation of the ellipse is $\frac{(x-5)^2}{25}+\frac{y^2}{16}=1$.

The architects label the vertices of the ellipse A and B.

Circle C is tangent to the x axis at Q, and P is a point on the circle such that PB is a tangent line to the circle.

They wish to construct three irrigation pipes connecting P to A to B, and back to P, forming triangle PAB.

What is the total length of the irrigation pipes forming triangle PAB? Answer to the nearest tenth.

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Key

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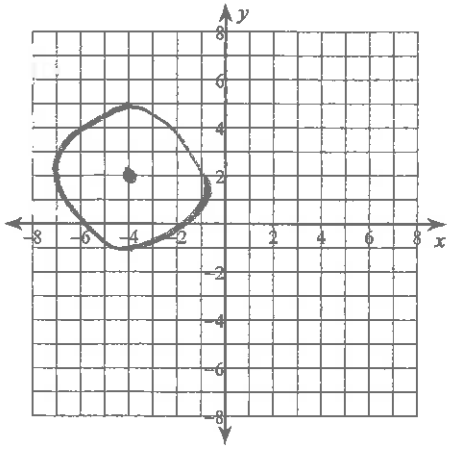
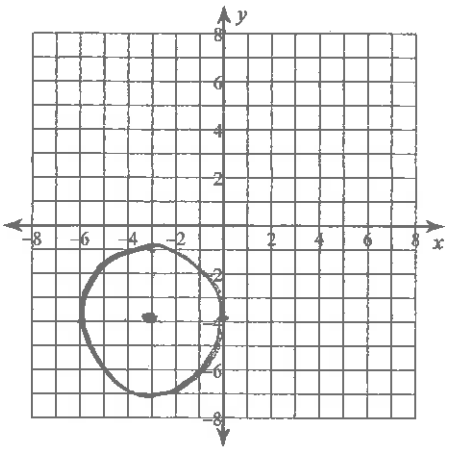
1) $(x+4)^2+(y-2)^2=9$



Centre = $(-4, 2)$

$r = 3$

2) $x^2+y^2+6x+8y+16=0$



$x^2+6x\ \underline{+9}\ +y^2+8y\ \underline{+16} = -16$

$+9$

$+16$

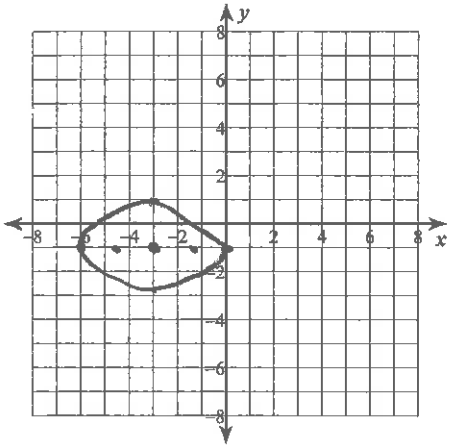
$(x+3)^2+(y+4)^2=9$

Centre = $(-3, -4)$

$r = 3$

Identify the center, vertices, co-vertices, foci, length of the major axis, and length of the minor axis of each. Then sketch the graph.

3) $\dfrac{(x+3)^2}{9}+\dfrac{(y+1)^2}{4}=1$



$(h,k)=(-3,-1)$ ✓

$a=3$ ✓

$b=2$ ✓

$a^2=b^2+c^2$ ✓

$9=4+c^2$ ✓

$c=\sqrt{5}$ or $-\sqrt{5}$ ✓

foci: $(-3+\sqrt{5},-1)$ ✓

$(-3-\sqrt{5},-1)$ ✓

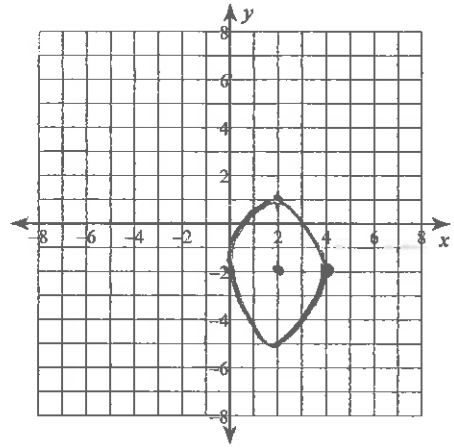
major axis = 6 units ✓

vertices: $(0,-1)$ and $(-6,-1)$ ✓

minor axis = 4 units ✓

covertices: $(-3,1)$ and $(-3,-3)$ ✓

4) $9x^2+4y^2-36x+16y+16=0$



$9x^2-36x$ _____ $+4y^2+16y$ _____ $=-16$

$9(x^2-4x+4)+4(y^2+4y+4)=-16+36+16$

$9(x-2)^2+4(y+2)^2=36$

$\dfrac{9(x-2)^2}{36}+\dfrac{4(y+2)^2}{36}=1$

$\dfrac{(x-2)^2}{4}+\dfrac{(y+2)^2}{9}=1$

$(h,k)=(2,-2)$ ✓

$a=2$ ✓

$b=3$ ✓

$b^2=a^2+c^2$

$9=4+c^2$

$c=\sqrt{5}$ or $-\sqrt{5}$ ✓

foci: $(2,-2+\sqrt{5})$ ✓

$(2,-2-\sqrt{5})$ ✓

major axis = 6 units ✓

vertices $(2,1)$ and $(2,-5)$ ✓

minor axis = 4 units ✓

covertices $(4,-2)$ and $(0,-2)$ ✓

Solve each system of equations.

5) $x^2 + y^2 + 15x + 3y - 4 = 0$
$-3x + y + 4 = 0$

$y = 3x - 4$

$x^2 + (3x-4)^2 + 15x + 3(3x-4) - 4 = 0$

$x^2 + 9x^2 - 24x + 16 + 15x + 9x - 12 - 4 = 0$

$10x^2 = 0$

$x = 0$ ✓

$y = -4$ ✓

$(0, -4)$ ✓

6) $3x^2 + 2y^2 - 3x - 31y - 36 = 0$
$x + y + 3 = 0$

$y = -x - 3$

$3x^2 + 2(-x-3)^2 - 3x - 31(-x-3) - 36 = 0$

$3x^2 + 2(x^2 + 6x + 9) - 3x + 31x + 93 - 36 = 0$

$3x^2 + 2x^2 + 12x + 18 - 3x + 31x + 93 - 36 = 0$

$5x^2 + 40x + 75 = 0$

$5(x^2 + 8x + 15) = 0$

$5(x+5)(x+3) = 0$

$x = -5$ ✓

$\therefore y = 2$ ✓

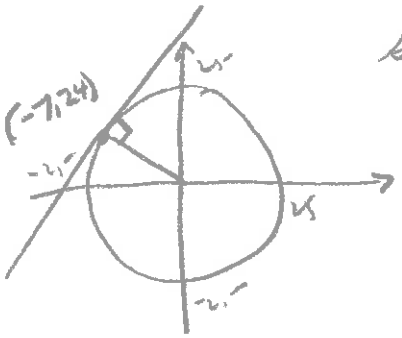
$x = -3$ ✓

$\therefore y = 0$ ✓

$(-5, 2)$ and $(-3, 0)$ ✓

⑦ $x^2+y^2=625$ (circle)

at $x=-7$ $y=24$



slope of radius $= \frac{-24}{7}$

$\therefore$ slope of tangent $= \frac{7}{24}$

$y = \frac{7}{24}x + b$

$24 = \frac{7}{24}(-7) + b$

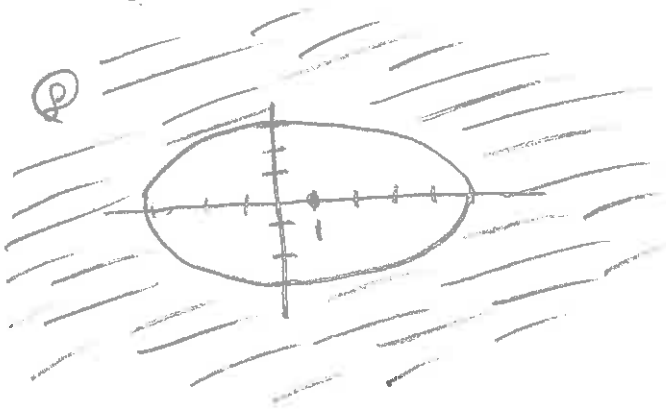
$24 = \frac{-49}{24} + b$

$b = 24 + \frac{49}{24} = \frac{625}{24}$

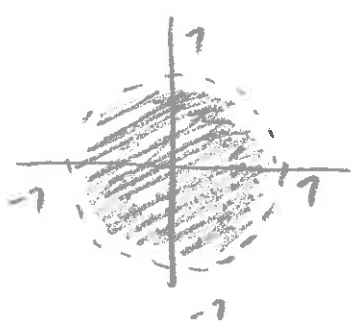
$y = \frac{7}{24}x + \frac{625}{24}$

$24y = 7x + 625 \longrightarrow \underline{7x - 24y + 625 = 0}$

⑧

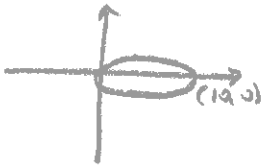


⑨



1e

1) $m\overline{AB} = 10$ ✓



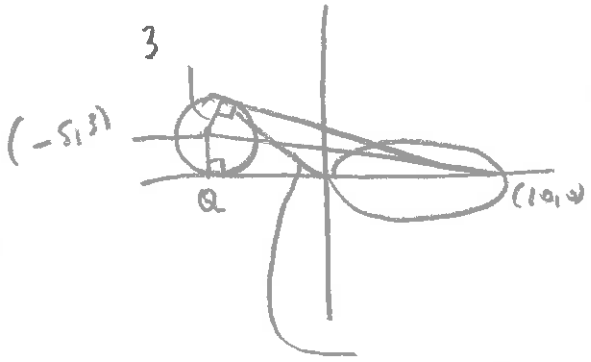
2)

$(\sqrt{234})^2 = 3^2 + PB^2$

$PB^2 = 234 - 9$

$PB^2 = 225$

$m\overline{PB} = 15$ ✓



$\sqrt{(10--5)^2 + (-3)^2} = \sqrt{234}$

3) $\tan \angle PBC = \frac{3}{15}$; $\angle PBC = \tan^{-1}\left(\frac{3}{15}\right) = 11.3°$

$\sin \angle CBQ = \frac{3}{\sqrt{234}}$; $\angle CBQ = \sin^{-1}\left(\frac{3}{\sqrt{234}}\right) = 11.3°$

$\therefore \angle PBA = 22.6°$

$(\overline{PA})^2 = (AB)^2 + (PB)^2 - 2(AB)(PB)\cos 22.6°$

$= 100 + 225 - 2(10)(15)\cos 22.6°$

$= 48.03$

$m\overline{PA} = 6.93$

$\therefore$ length $= 10 + 15 + 6.93$

$= 31.9$ m