Circle 3
part(i)

Two circles intersect at p(2,0) and q(-2,8).

The distance from the centre of each circle to the common chord [pq] is $\sqrt{20}$.

Find the equations of the two circles.

Circle 3
part(i)

A circle has its centre in the 1st quadrant.

The x-axis is a tangent to the circle at the point (3,0).

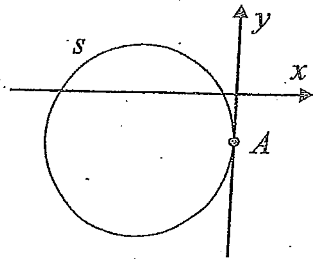
The circle cuts the y-axis at two points that are 8 units apart. Find the equation of the circle.

Circle Revision

Circle 3
part (ii)

Question 3

Circle $s: x^2 + y^2 + 2gx + 2fy + c = 0$ touches the y-axis at the point $A(0, -2)$.



(a) Determine the value of f and hence, show that c is equal to 4.

(b) The centre of s lies in the third quadrant and s makes a chord of length $4\sqrt{3}$ on the x-axis. Find the value of g and hence, write down the equation of s.

(c) Find the equations of the two tangents from the origin to s.

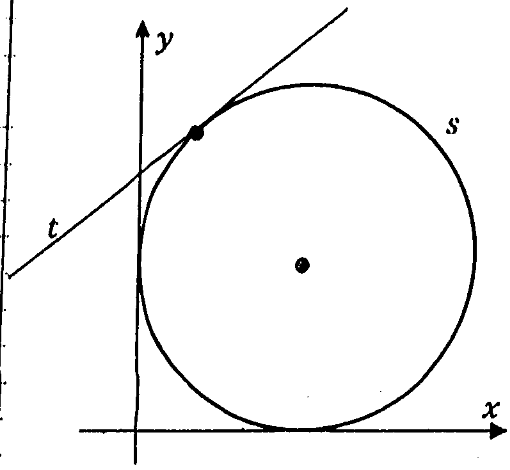
Class 3
part (iii)

Question 3 **(25 marks)**

(a) The point $(-2, k)$ is on the circle $(x-2)^2 + (y-3)^2 = 65$.
Find the two possible values of k, where $k \in \mathbb{Z}$.

Class 3
Part (iii)

(b) The circle s is in the first quadrant. It touches both the x-axis and the y-axis.
The line t: $3x - 4y + 6 = 0$ is a tangent to s as shown. Find the equation of s.



Circle 3
Part (iv)

Pre Paper 2016

The points a(-2,4) , b(0,-10) and c(6,-2) are the vertices of a triangle.

(i) Verify that the triangle is right-angled at c

(ii) Hence, or otherwise, find the equation of the circumcircle that passes through the points a, b and c.

Circle 3
Homework

Question 3 (25 marks)

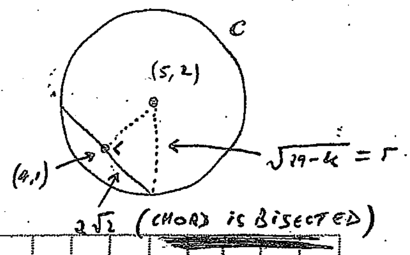
(a) Write down the centre of the circle $c: x^2 + y^2 - 10x - 4y + k = 0$ and find the radius-length in terms of k.

centre $(5, 2)$

Radius $= \sqrt{5^2 + 2^2 - k} = \sqrt{29 - k}$

(b) The midpoint of a chord of c is $(4, 1)$ and its length is $4\sqrt{2}$.

(i) Find the radius-length of c. HINT: Form a Δ.... pythagoras....



distance from $(4,1)$ to $(5,2)$

$= \sqrt{(5-4)^2 + (2-1)^2} = \sqrt{2}$

Pythagoras $R^2 = (\sqrt{2})^2 + (2\sqrt{2})^2$

$R^2 = 2 + 8$

$R = \sqrt{10}$

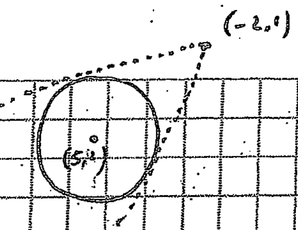
(ii) Hence, find the value of k.

let $\sqrt{29 - k} = \sqrt{10}$

$29 - k = 10$

$19 = k$

(c) Find the slopes of the tangents to c from the point $(-2, 1)$.



see notes from 1st year

1st fill in $y - y_1 = m(x - x_1)$ for eqns of 2 tangents

$y - 1 = m(x + 2)$

$y - 1 = mx + 2m$

$0 = mx - y + 2m + 1$ now find 2 values of m.

use $\perp$ dist = Radius

$x_1 = 5$ $a = m$

$y_1 = 2$ $b = -1$

$c = 2m + 1$

$$\frac{m(5) - 1(2) + 2m + 1}{\sqrt{m^2 + 1}} = \sqrt{10}$$

$7m - 1 = \sqrt{10m^2 + 10}$

$49m^2 - 14m + 1 = 10m^2 + 10$

$39m^2 - 14m - 9 = 0$

$(13m - 9)(3m + 1)$

$m = 9/13$ $m = -1/3$

The circle $x^2+y^2+2gx+2fy+c=0$ passes through the points $(3,3)$ and $(4,1)$. 3

The line $3x-y-6=0$ is a tangent to the circle at $(3,3)$ Homework

(i) Find the equation of the circle

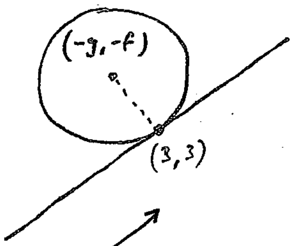
(ii) Find the co-ordinates of the point on the circle at which the tangent parallel to $3x-y-6=0$ touches the circle.

$\longrightarrow$ solution

Q2 $\quad x^2+y^2+2gx+2fy+c=0$

$(4,1)$ $\quad \boxed{17+8g+2f+c=0}$ ①

$(3,3)$ $\quad \boxed{18+6g+6f+c=0}$ ②



TANGENT: $3x-y-6=0$
slope $=3$

Misprint on sheet should be (3,3) here

$\therefore \perp$ SLOPE $= \frac{-1}{3}$

$\therefore$ SLOPE OF RADIUS $= \frac{-1}{3}$

$\frac{y_2-y_1}{x_2-x_1} = \frac{3+f}{3+g} = \frac{-1}{3}$ (cross-multiply)

$9+3f=-3-g$

$\boxed{3f+g+12=0}$ ③

Sim. Eqns:

① $\quad 17+8g+2f+\cancel{c}=0$

② $\quad -18-6g-6f-\cancel{c}=0$

$-1+2g-4f=0$

$3f+g+12=0 \quad (\times -2)$

$-4f+2g-1=0$

$-6f-2g-24=0$

$-4f+2g-1=0$

$-10f-25=0$

$-25=10f$

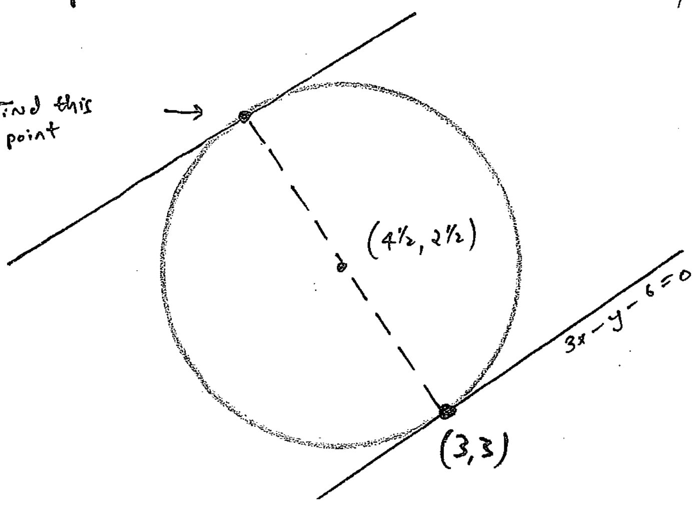
$\boxed{-2\tfrac{1}{2}=f}$

then $\boxed{g=-4\tfrac{1}{2}}$ $\quad \boxed{c=24}$

$\boxed{\text{Ans: } x^2+y^2-9x-5y+24=0}$

(ii) Find the other point on the circle where there is another tangent parallel to $3x-y-6=0$

Find this point



$\boxed{\text{CENTRE is } (-g,-f) = (4\tfrac{1}{2}, 2\tfrac{1}{2})}$

USE A TRANSLATION →

$(3,3) \xrightarrow[+1\frac{1}{2},\,-\frac{1}{2}]{} (4\tfrac{1}{2}, 2\tfrac{1}{2}) \xrightarrow[+1\frac{1}{2},\,-\frac{1}{2}]{} (6,2)$

Ans: $(6,2)$