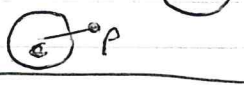
Circle

eqn of Circle : $x^2+y^2+2gx+2fy+c=0$

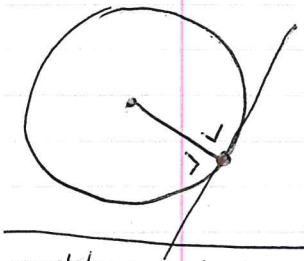
centre $= (-g, -f)$ radius $= \sqrt{g^2+f^2-c}$

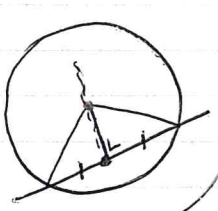
if centre $= (0,0)$ then $r^2 = c$, circle $= x^2+y^2=r^2$

If a point P is inside circle $x^2+y^2+2gx+2fy+c=0$ then $|PC| < r$, if it is outside circle $|PC| > r$ if it is on circle $|PC| = r$.

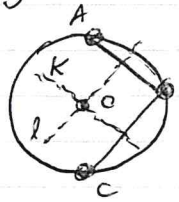


Q16 p117





If you know 3 points - can find eqn



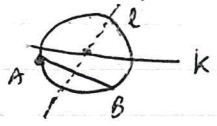
Find mp AB, then slope AB then slope $\perp$ AB then eqn of l.

Find M BC, then slope BC, then slope $\perp$ BC then eqn of k

O is where l and k intersect. p119 E1

another way if you know 3 points is to sub in for (x,y) and get 3 simultaneous eqns with 3 unknowns g, f, c p120 E2

If you know 2 points and a line through centre:

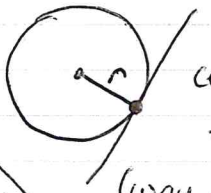


Find eqn of l by getting mp of AB, slope AB

Slope $\perp$ AB (= slope l)

then find point of intersection of l and k

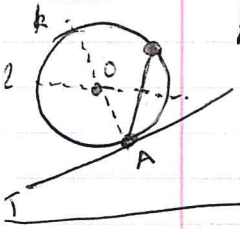
r = distance (OA)



Distance from centre to tangent = radius!

(way to show a line is a tangent to a ○)

DRAW DIAG'S

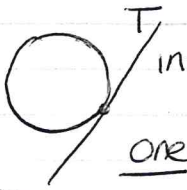


K = line $\perp$ T thro A - find eqn k

l = line thro mp of AB, $\perp$ AB find eqn l

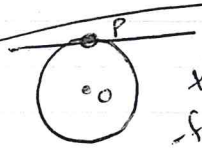
O = where l, k intersect

r = distance (OA)



Tangent intersects in only one place

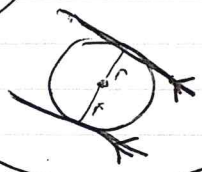
Finding the equation of a tangent:

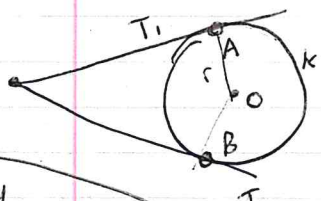


find slope (OP), slope $\perp$ (OP) = slope T, thro P

then find eqn T

E2 p127





given P, given k

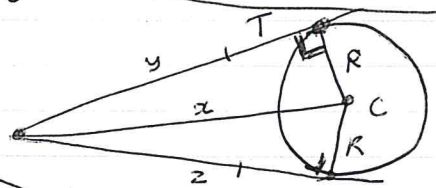
find eqns of the two tangents?

Put P into $y-y_1 = m(x-x_1) = T$

then let $|T_{(line)}, O| = r$ and you will get 2 values for m corresponding to T_1, T_2

E3 p128

length of tangent to a circle



$x^2 = y^2+R^2$ $x^2 = z^2+R^2$

$y^2 = x^2-R^2$ $z^2 = x^2-R^2$

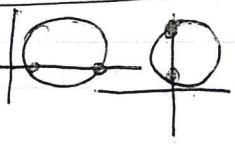
$\therefore y = z$ (also congruent $\triangle$'s)

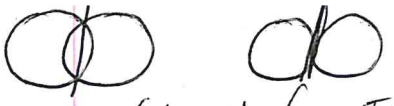
Find length of tangent from $(-5, 8)$ to $x^2+y^2-4x-6y+3=0$

Use simultaneous eqns to find where line intersects ○

Use eqn of line to get x in terms of y, then sub into eqn of circle. Find pts of intersection of $x+2y-1=0$ and $x^2+y^2+2x+8y-8=0$

REM: Circle intersects x axis where $y=0$, Circle intersects y axis where $x=0$





Common Chord (or Tangent) : $C_1 = x^2 + y^2 - 4x - 2y - 4 = 0$

$C_2 = x^2 + y^2 - 6x + 4y - 3 = 0$

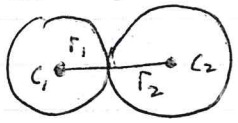
$C_1 - C_2 = 2x - 6y - 1 = 0$

To find point of intersection of 2 circles = (i) Find Common Chord
(ii) Find where Common Chord intersects 1 circle

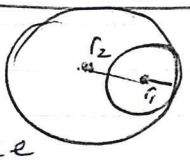
13 P134

Q Find points of intersection of $x^2+y^2+4x-2y-5=0$, $x^2+y^2+14x-12y+65=0$

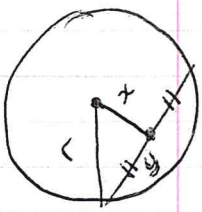
(Circles that touch:)



Distance between centres $|C_1C_2| = r_1 + r_2$

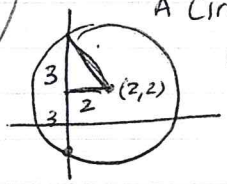


Distance between centres $= r_2 - r_1$



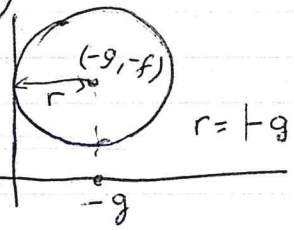
$r^2 = x^2 + y^2$

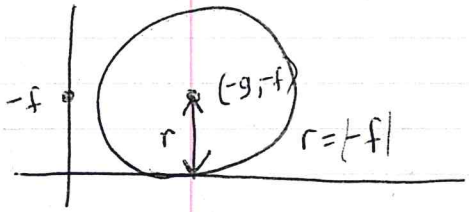
A Circle k has centre (2,2) and makes a chord 6 units in length with y axis. Find eqn k.



$r^2 = 3^2 + 2^2 = 13$

Circles touching X, Y axis





Find eqns of 2 circles containing (3,-2), (2,-1) and which touch the x axis

Sub in (3,2) (2,-1) into $x^2+y^2+2gx+2fy+c=0$

→ get 2 eqns with 3 unknowns but you also know $r = |-f|$ $\sqrt{g^2+f^2-c} = |-f|$

$g^2+f^2-c = f^2$

$g^2 = c$

* Rem another way to write the eqn of a circle is $(x-h)^2 + (y-k)^2 = r^2$ (h,k) = centre, r = radius