CIRCLE SOLUTIONS

(1) $5x^2-10x+5=0$
$\hookrightarrow b^2-4ac=0 \therefore$ tangent
$\hookrightarrow (1,4)$.

(2) a) $A=(6,1)$
$M_{AP}=2$
$M_{TP}=-\frac{1}{2}$

b) sub $x=3-2y$.
$\hookrightarrow 5y^2-30y+45=0$
$\hookrightarrow b^2-4ac=0 \therefore$ tangent
$\hookrightarrow (-3,3)$

c) $PQ=4\sqrt{5}$ units

(3) a) P is midpoint of AB
$A=(-3,-2)$
$B=(3,6)$
$\therefore P=(0,2)$

b) $AB=10$ units

(4) $k=6$. radius $=\sqrt{37}$

(5) a) $(x+2)^2+(y-3)^2=18$
b) $Q=(-5,0) \Rightarrow y=-x-5$

(6) a) mid $=(3,2)$
$M_{AB}=1$
$M_{PB}=-1$
$y-2=-(x-3)$
$\hookrightarrow$ proof.

b) $M_{tan}=-\frac{1}{3}$
$\therefore M_{rad}=3$
$y-0=3(x-1)$
$\underline{y=3x-3}$

c) (i) Perp bisectors of chords intersect at the centre.
$\therefore$ SIM EQNS $\rightarrow (2,3)$
(ii) $(x-2)^2+(y-3)^2=10$

(7) $B=(7,8)$
large $R=6$
small $R=2$
$\therefore D=(15,8)$
$\therefore (x-15)^2+(y-8)^2=4$

(8) a) $(-4,-2)$
$R_1=\sqrt{58}$

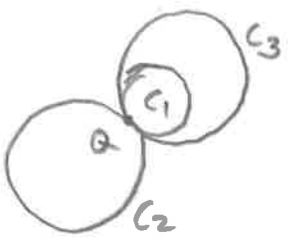
b) $C_2=(4,6)$
$R_2=\sqrt{26}$
Distance $=8\sqrt{2}=11.3$ units.
$R_1+R_2=12.7$ units
$\therefore$ Circles meet at two points as $R_1+R_2>D$.

c) Sub $y=6-x$ into C_1
$\hookrightarrow 2x^2-4x-6=0$
$\hookrightarrow (3,1)$ and $(-1,5)$

(9) a) Sub $x=5,\ y=10$ into circle.

b) $C=(-1,2)$
$Q=(-7,-6)$
$M_R=\frac{4}{3}$
$M_T=-\frac{3}{4}$
$3x+4y=-45$

c)



$C_2: (x+19)^2+(y+22)^2=400$

$C_3: (x-5)^2+(y-10)^2=400$

(10) a) $C_1 = (-1,-2)$
$R = 4\sqrt{2}$

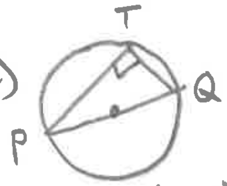
b) $M_R = 1$
$M_T = -1$
$y = 5 - x$

c) $R_2 = 2\sqrt{2}$
$= \sqrt{8}$ $\therefore (x-10)^2 + (y+1)^2 = 8$
↳ equation.

d) $2x^2 - 32x + 128 = 0$
↳ $b^2 - 4ac = 0$ $\therefore$ tangent.

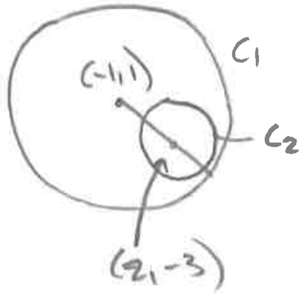
(11) a) $10x^2 + 40x + 30 = 0$
$\rightarrow (1,-2)$ and $(3, 4)$

b) $M_T = (-1, 2)$
$M_{PT} = -2$
$M_{QT} = \frac{1}{2}$

c) 

$C = (2,1)$
$r = \sqrt{10}$
$\therefore (x-2)^2 + (y-1)^2 = 10$

(12) C_1: centre $(-1, 1)$ $r = 11$
C_2: centre $(2,-3)$ $r = \sqrt{13-p}$.



Distance between centres = 5units.
$\therefore$ radius of $C_2 < 6$ if circles don't touch.

$\therefore \sqrt{13-p} < 6$
$13 - p < 36$
$-p < 23$
$\underline{p > -23}$

Also, to be a circle $r > 0$
$\therefore \sqrt{13-p} > 0$
$13 - p > 0$
$-p > -13$
$\underline{p < 13}$

$\therefore$ $\underline{-23 < p < 13}$