2. Graphical methods

1. $x^2 + 4x + y^2 = 5$

$x^2 + 4x + (\frac{1}{2} \times 4)^2 + y^2 = 5 + (\frac{1}{2} \times 4)^2$

$(x + 2)^2 + (y + 0)^2 = 5 + 4$

$(x + 2)^2 + (y + 0)^2 = 9$

Centre (-2,0)

Radius $\sqrt{9}$

$r = 3$ units

2. $x^2 + 6x + (3)^2 + y^2 - 10y + (-5) = 2 + 9 + 25$

$(x + 3)^2 + (y - 5)^2 = 36$

$(x - -3)^2 + (y - +5)^2 = 6^2$

$\therefore$ centre (-3, 5)

Radius 6 units

Completing of sq. for expression in x and y.

√Expression.

√Centre

√Radius

3. $CBE = 40^0$ (alt.segiment theoren)

$\angle BCE = 120^0$ (Suppl. To $BCD = 60^0$ alt. seg.)

$\therefore (40 + 120 + E) = 180^0$ (Angle sum of Δ)

$\angle BEC = 20^0$

4. $X^2 + Y^2 - 10Y + 25 = 25 - 16$

$(X - 0)^2 + (Y - 5)^2 = 9$

$(X - 0)^2 + (Y - 5)^2 = 3^2$

Centre (0, 5)

Radius = 3

5.

x	-5	-4	-3	-2	-1	0	1
x^3	-125	-64	-27	-8	-1	0	1
$6x^2$	150	96	54	24	6	0	6
$8x$	-40	-32	-24	-16	-8	0	8
y	-15	0	3	0	-3	0	15

$x^3 + 6x^2 + 8x > 1$

Between

(i) $x = -3.85$ 0.1 and x -2.15 0.1

(ii) $x > 0.5 \pm 0.1$

6. $y = x^3 - 3x + 2$

$x = 0, y = 2$

$(0, 2) \Rightarrow y$ – intercept.

$\frac{dy}{dx} = 3x^2 - 3 = 0$

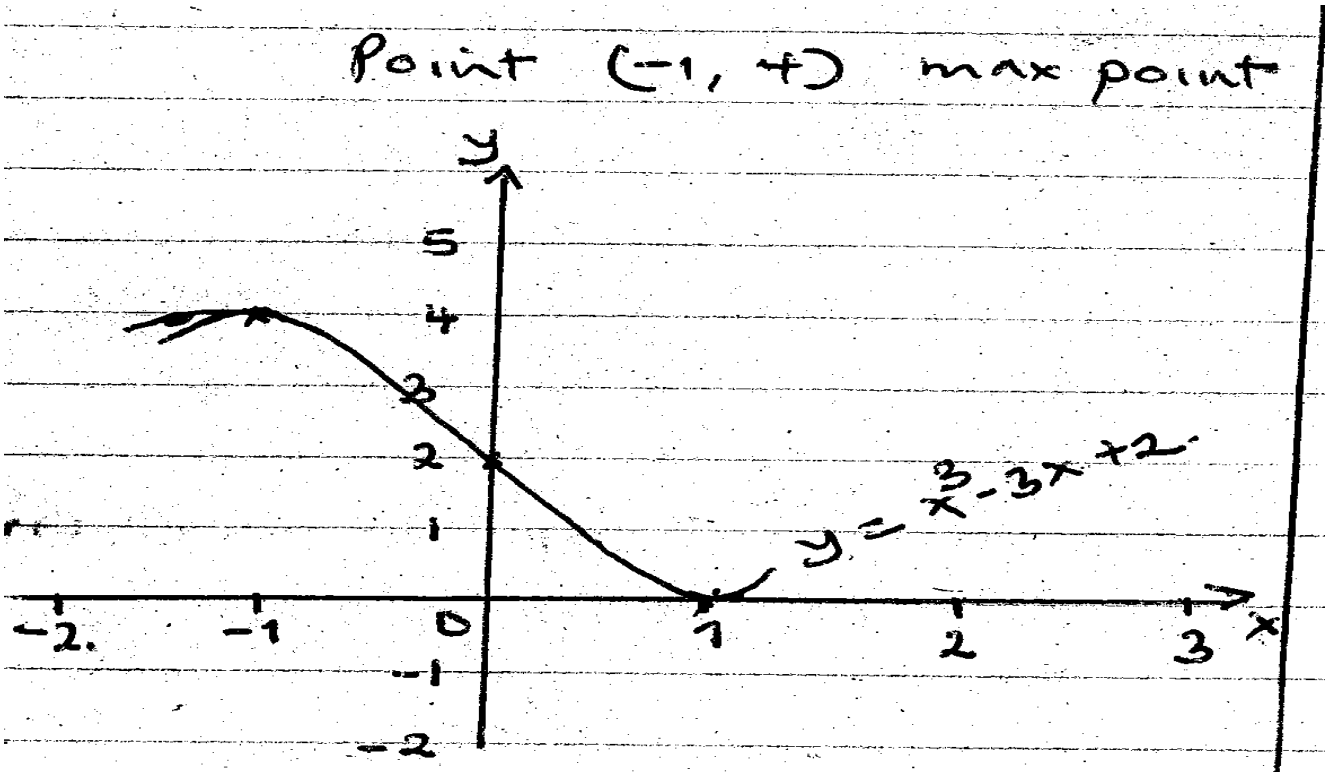
$x^2 = 1$

$x = \mp 1$

$x = 1 \quad y = 0$

Point (1, 0) min point
x = -1, y= 4

Point (-1, 4) max point.



7. $4x_2 - 12x + 4y^2 + 12y = 7$
$x^2 - 3x + y^2 + 3y = {}^7/_4$
$x^2 - 3x + ({}^3/_2)^2 + y^2 + 3y + ({}^3/_2)^2 = {}^7/_4 + {}^9/_4 + {}^9/_4 = {}^{25}/_4$
$(x - {}^3/_2)^2 + (y + 3/2)2 = 25/4$
$\therefore$ Centre (1,5, -1.5) Radius 2.5units

8. $\log R = n\log p + \log K$

Log P	0.48	0.54	0.60	0.65	0.70
Log R	1.56	1.69	1.81	1.91	2.00

$\text{Gradient} = \frac{2 - 0.6}{0.7}$
$= \frac{1.4}{0.7} = 2$
Log R intercepts = 0.6 = logk
K= 4
The law connecting R and P is $R=4P^2$
$900 = 4P^2$
$P^2 = \frac{900}{4}$
$225 = P^2$

9. $(x+2)^2 (y-3)^2 = 3^2$
$X^2 + 4x + 4 + y^2 - 6y + 9 = 3^2$
$X^2 + y^2 + 4x - 6y + 4 = 0$

10.

V	0	2	4	6	8	10
$\frac{1}{T}$	2.04	3.33	4.17	5	6.25	7.30

$T = a$

$b + V$

$\frac{I}{T} = \frac{b + V}{a}$

$\frac{I}{T} = \frac{1}{a}V + \frac{b}{a}$

$y = mx + C$

b) (i) $\frac{1}{a} = Grad \Rightarrow \frac{\Delta y}{\Delta x} = \frac{7.3 - 5}{10 - 6} = \frac{2.3}{4} = 0.575$

$a = 1.739$

$\frac{b}{a} = y - Intercept \Rightarrow 2.04$

$\frac{b}{1.739} = 2.04 \qquad b = 2.04 \times 1.739$

$= 3.547556$

$b \simeq 3.548$

(ii) $T = 0.38$

$\frac{I}{T}$ = 2.63 shown on graph

$V = 1$

-1

(iii) $\frac{I}{T} = 4.45$

$T = (4.45)$

$= 0.2247$

$\simeq 0.22$

11. $y = 2x^3 + x^2 + 3x - 1$

$\frac{dy}{dx} = 6x^2 + 2x + 3$

gradeindent at (1, -5)

$= 6 + 2 + 3 = 11$

$\frac{y-(5)}{x-1} = 11$

$y + 5 = 11x - 11$

$y = 11x - 16$

12. $3^5 = 3^{-4} \times 3^{-x}$

$3^5 = 3^{-4-x}$

$-4 - x = 5$

$-x = 9$

$x = -9$

13. $x^2 + 2x + 1 + y^2 - 4y + 4 = 4 + 1 + 1$

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

Centre (-1, 2)

Radius 3units

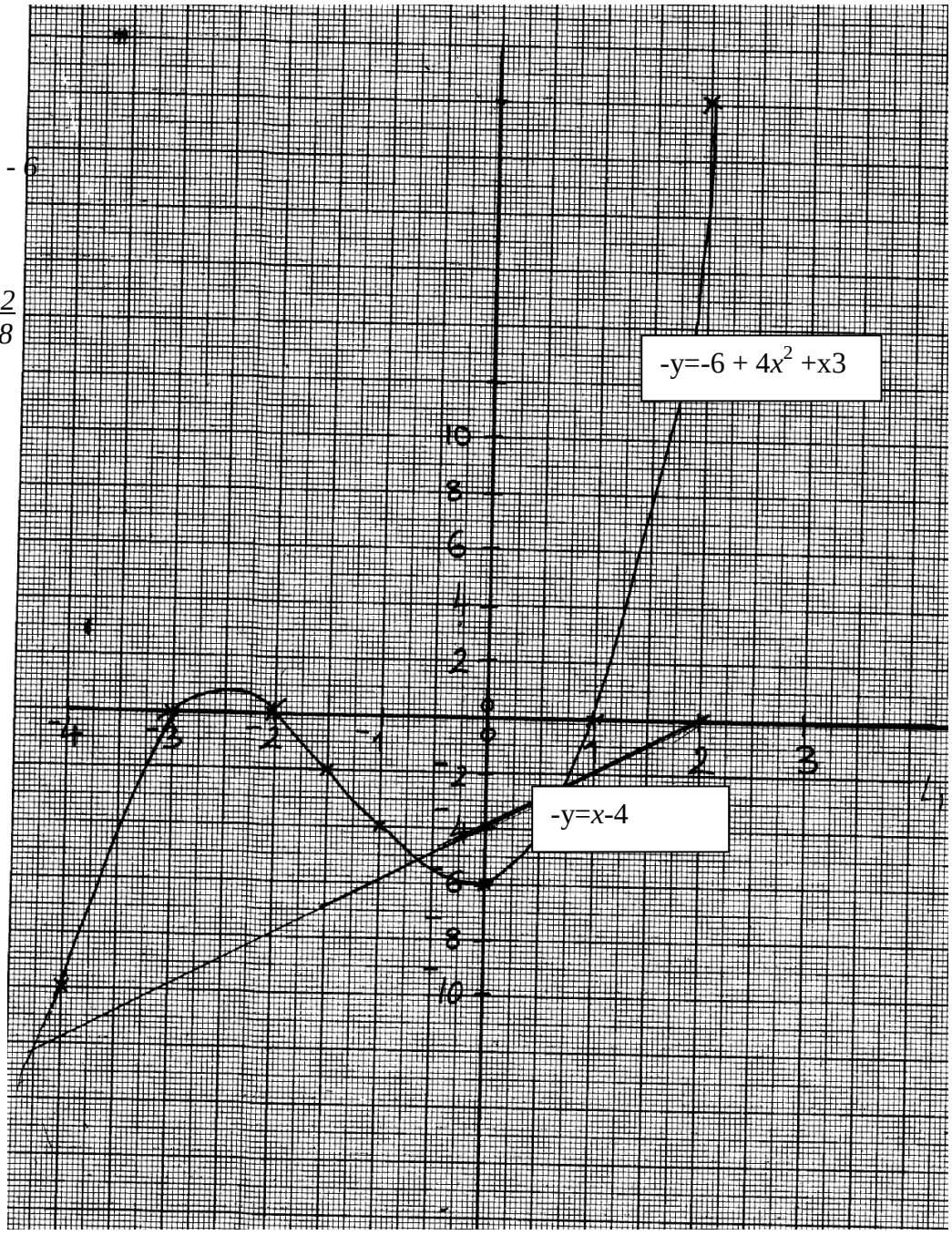
14. c)

X	*-4*	*-3*	*-2*	*-1*	*0*	*1*	*2*
-6	*-6*	*-6*	*-6*	*-6*	*-6*	*-6*	*-6*
X	*-4*	*-3*	*-2*	*-1*	*0*	*1*	*2*
$4x^2$	*64*	*36*	*16*	*4*	*0*	*4*	*16*
X^3	*-64*	*-27*	*-8*	*-1*	*0*	*1*	*8*
$Y=-6+x+4x^2+x^2$	*-10*	*0*	*0*	*-4*	*-6*	*0*	*20*

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

(iii) $y = x^3 + 4x^2 + x - 6$
$0 = x^3 + 4x^2 + 0 - 2$
$y = x - 4$

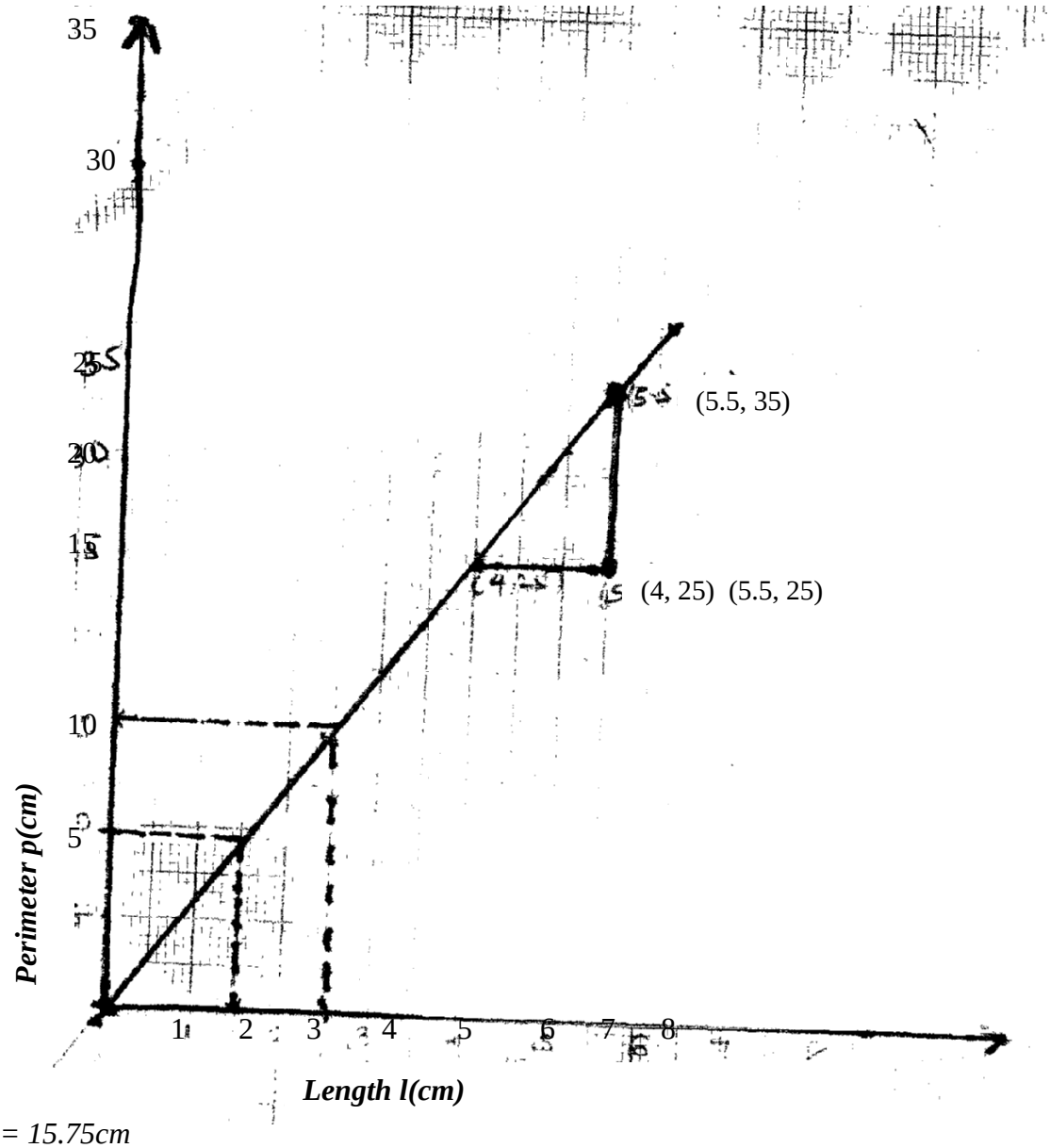
x	*1*	*0*	*-2*
y	*-3*	*-4*	*-8*



c *(i) solution 0.8*
-1.5
And -3.2

(c) 1, -2, -3

15.



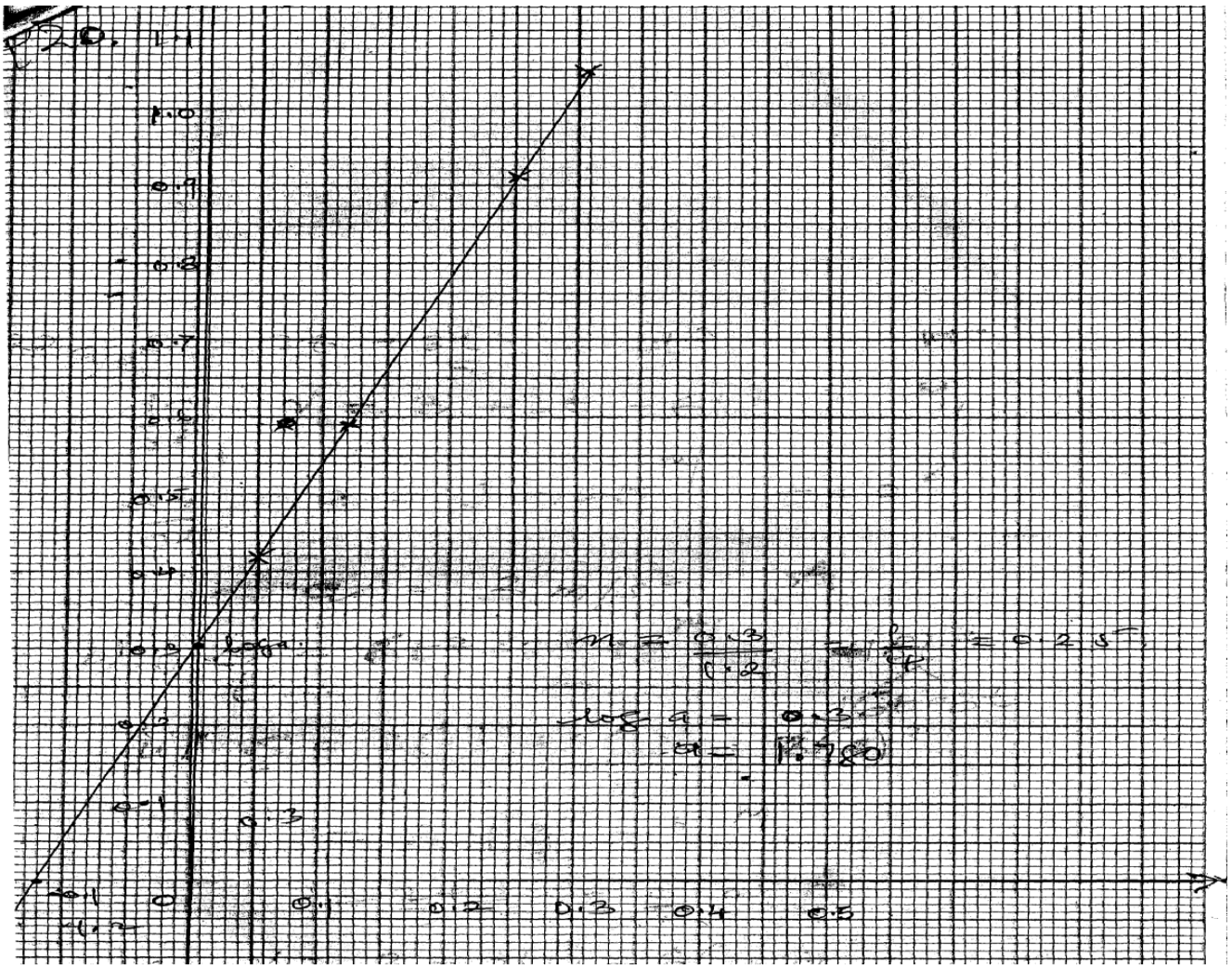
(i) P = 15.75cm
(ii) l=1.5cm
(iii) m = 35- 25 = 10 = (
5.5 – 4.0 1.5

(c) choose P(5,31.4)
p - 31.4 = 10
l -5 1.5
p-31.4 = 100
l-5 1.5
15p – 471 = 100k – 500
15p = 100l – 29
15 15
2k = 100
15
k= 100 = 3.33
2 x 15
c =1.93

$P + 0.6 = ar^h$
Log (P + 0.6) = log a + n log R

$= n \log R + \log 9$

$P + 0.6$	1.33	2.65	3.85	8.04	11.22
$\log (P + 0.6)$	-0.13	0.42	0.59	0.91	1.05
$\log R$	-0.05	0.05	0.12	0.25	0.30



$\log 0.3 = ¼ = 0.25$

$\log a = 0.3$

17. $x^2 + y^2 - 6x = 3 - 4y$

$x^2 - 6x + (^6/_2)^2 + y^2 + 4y + (^4/_2)^2 = 3 + (^6/_2)^2 + (^4/_2)^2$

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

$(x - 3)^2 (y + 2)^2 = 16$

$C (3, -2)$

Gradient $\frac{\Delta y}{\Delta x} = \frac{7 - -2}{6 - 3} = 3$

18.

x	-3	-2	-1	0	1	2	3	4
$-x^3$	27	8	1	0	-1	-8	-27	-64
$2x^2$	18	8	2	0	2	8	18	32
$-4x$	12	8	4	0	-4	-8	-12	-16
2	2	2	2	2	2	2	2	2
y	59	26	9	2	-1	-6	-19	-46

b) Check on the graph paper.
c) $x = 0.5 \pm 0.1$
d) $-x^3 + 2x^2 - 5x + 3 = 0$
Line to allow: $y = x - 1$

x	0	1
y	-1	0

$x = 0.65$

19. $\frac{Dy}{dx} = 12x^2 - 12$
$12x^2 - 12 = 0$
$12(x^2 - 1) = 0$
$x = 1$
$x = -1$

At x = 1 *At x = -1*

0	1	2	-2	-1	0
GRD = 12	0	36	36	0	-12

\- 0 + + 0 -

(1,7) (-1, 9)
Minimum *maximum*

20. *(a) table*
(b) plotting
scale
smooth curve
(c) (i) $-0.5 < x < 1$ and $x > 1$
(iii) $x = 2.5 \pm 0.1$

21. $2x^2 + 2y^2 - 6x + 10y + 9 = 0$
$x^2 + y^2 - 3x + 5y + 9/2 = 0$
$x^2 + y^2 - 3x + 5y = -9/2$
$x^2 - 3x + \frac{9}{4} + y^2 + 5y + \frac{25}{4} = 8.5 - 4.5$
$(x - \frac{3}{2})^2 + (y + \frac{5}{2})^2 = 4$
Radius = 2 units
Centre = (1.5, -2.5)