P425/**1**
Pure mathematics
Paper 1
JULY/AUG 2023
3 hours

KAMSSA Mock Examinations
Uganda Advanced Certificate of Education
PURE MATHEMATICS
GUIDE
3 hours

INSTRUCTIONS:

- Answer all the ***eight*** questions in section ***A*** and any ***five*** in section ***B***.
- Any additional question(s) answered will not be marked.
- All necessary working **must** be clearly shown.
- Begin each answer on a fresh sheet of paper.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A (40 MARKS)

Answer all questions in this section

1. Solve for x in: $3\cot x + cosec\ x = 2$ for $0^0 \leq x \leq 360^0$. (05 marks)

$3\cot \boldsymbol{x} \cos c\ \boldsymbol{x}$=2 $\quad$ $0° \leq \boldsymbol{x} \leq 360°$

Soln

$\frac{3\cos x}{\sin x}+\frac{1}{\sin x}=2$

3cosx-2sinx=-1

MT*D* 1

$3\cos \boldsymbol{x} = 2\sin \boldsymbol{x} = R\cos(\boldsymbol{x}+\propto)$

$= R\cos x \cos\propto - R\sin x \sin\propto$

$R\cos\propto = 3 \qquad R\sin\propto = 2$

$\text{Tan}\propto = \frac{2}{3}$

$\propto = 33.69$

$(\boldsymbol{R\cos}\ \propto)^2 + (\boldsymbol{R\sin}\ \propto)^2 = (\boldsymbol{3})^2 + (\boldsymbol{2})^2$

$R^2 = 13$

$R = \sqrt{\boldsymbol{13}}$

$3\cos \boldsymbol{x} - 2\sin \boldsymbol{x} = \sqrt{\boldsymbol{13}}\cos(\boldsymbol{x} + \boldsymbol{33.69}°)$

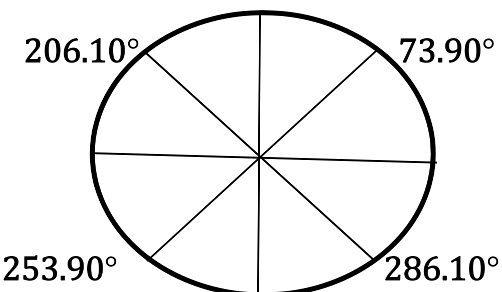
So; $\sqrt{\boldsymbol{13}}\cos(\boldsymbol{x} + \boldsymbol{33.69}°)$=-1

$\boldsymbol{x}+33.69° = \cos^{-1}\left(\frac{1}{\sqrt{13}}\right)$

$\boldsymbol{x}+33.69° = 73.90°$

$\boldsymbol{x}+33.69° = 106.10°, 253.90°$

$\boldsymbol{x} = 72.41°, 220.21°$



MT*D* II

$3\cos\propto - 2\sin \boldsymbol{x} = -1$

$3\left(\frac{1-t^2}{1+t^2}\right) - 2\left(\frac{2t}{1+t^2}\right) = -\boldsymbol{1}$

$3-3t^2-4t=-1-t^2$

$2t^2 + 4t - 4 = 0$

$t^2+2t-2=0$

$t=\frac{-2\pm\sqrt{2^2-4(2)(-2)}}{2(1)}$

t=-2.7321

t=0.7321

$\tan\frac{x}{2} = -2.7321$

$\frac{x}{2} = 69.90°$

$\frac{x}{2} = 110.10°$

$\boldsymbol{x} = 220.20°$

$\tan\frac{x}{2} = 0.7321$

$\frac{x}{2} = 36.21°$

$\boldsymbol{x} = 72.42°$

$\therefore = \boldsymbol{72.42°, 220.20°}$

2. Find the number of ways the word *ARSENAL* can be arranged when the *A*'s are not close to each other. (05 marks)

ARSENAL

Total number of ways $= \frac{7!}{2!}$

=2520 ways

When the A's are together =6!

=720 ways

When the A's are not together =2520-720

=1800 ways

3. Express $p(x) = 2x^2 - 4x + 1$ in the form $a(x-b)^2 + c$ and hence state the least value of $p(x)$. (05 marks)

$P(x) = 2x^2 - 4x + 1$

$= 2\left(x^2 - 2x + \frac{1}{2}\right)$

$= 2\left(x^2 - 2x + (-1)^2 - (-1^2) + \frac{1}{2}\right)$

$= 2\left((x-1)^2 - \frac{1}{2}\right)$

$= 2(x-1)^2$

When $x = 1$,

$P(1) = 2(1-1)^2 - 1$

$= -1$

4. Differentiate and simplify the function: $\tan^{-1}\left(\frac{1+2x}{1-2x}\right)$. (05 marks)

let $y = \tan^{-1}\left(\frac{1+2x}{1-2x}\right)$

$\tan y = \frac{1=2x}{1-2x}$

$\text{Sec}^2 y.\frac{dy}{dx} = \frac{(1-2x).2-(1+2x)(-2)}{(1-2x)^2}$

$\text{Sec}^2.\frac{dy}{dx} = \frac{2-4x+2+4x}{(1-2x)^2}$

$\frac{dy}{dx} = \frac{4}{(1-2x)^2} \cdot \frac{1}{sec^2 y}$

$= \frac{4}{(1-2x)^2} \cdot \frac{1}{1+\left(\frac{1+2x}{1-2x}\right)^2}$

$= \frac{4}{(1-2x)^2} \cdot \frac{(1-2x)^2}{(1-2x)^2+(1+2x)^2}$

$= \frac{4}{1-4x+4x^2+1+4x+4x^2}$

$= \frac{4}{2+8x^2}$

$= \frac{2}{1+4x^2}$

5. Given that the equation $x^2 + 3x + 2 = 0$ has roots k and l, find the equation whose roots are $\frac{k}{l^2}$ and $\frac{l}{k^2}$. (05 marks)

$x^2 + 3x + 2 = 0$

K, l

Sum of old roots,

K+l =-3

Product of old roots B (for both sum and product)

Kl =2

Sum of new roots,

$\frac{k}{l^2}+\frac{l}{k^2}=\frac{k^3+l^3}{(lk)^2}$

$=\frac{(k+l)^3-3kl(k+l)m}{(lk)^2}$

$=\frac{(-3)^2-3(2)(-3)}{(2)^2}$

$=\frac{9}{4}$

Product of new roots

$\frac{k}{l^2}.\frac{l}{k^2}=\frac{1}{lk}$

$=\frac{1}{2}$

The eqn is x^2-$\left(\frac{-9}{4}\right)x+\frac{1}{2}=0$

$4x^2+9x+2=0$

6. Given that the equation $z^3-4z^2+6z-4=0$ has one of the roots as $i+1$, find the other roots. (05 marks)

z^3-4z^2+6z-4=0

$z=i+1=1+i$

$z=1-I\,\widehat{b}\ also\ a\ root$

sum of roots =2

product of roots =$(1+i)(1-i)$

=2

Diviser =z^2-2$z+2$

$$
\begin{array}{r}
z-2 \\
z^2 2z+2 \overline{\big)\, z^3-4z^2+6z-4} \\
-\ z^3-2z^2+2z \\
\hline
-2z^2+4z-4 \\
-\ -2z^2+4z-4 \\
\hline

\end{array}
$$

z^3-4z^2-6z-4=(z^2-2z+2) (z-2)

⇒ (z^2-4z^2+2) (z-2) =0

⇒ z-2=0

z=2

7. Show that the points $P(1,2,3)$, $R(3,8,1)$, and $T(7,20,-3)$ are collinear. (05 marks)

P (1,2,3,). R (3,8,1), T (7,20,3)

$\overrightarrow{PR}=\overrightarrow{OR}-\overrightarrow{OP}$, $\overrightarrow{PT}=OT$

$=\begin{pmatrix}3\\8\\1\end{pmatrix}-\begin{pmatrix}1\\2\\3\end{pmatrix}=\begin{pmatrix}7\\20\\-3\end{pmatrix}-\begin{pmatrix}1\\2\\3\end{pmatrix}$

$=\begin{pmatrix} 2 \\ 6 \\ -2 \end{pmatrix}=\begin{pmatrix} 6 \\ 18 \\ -6 \end{pmatrix}$

$\overrightarrow{PR}=K\overrightarrow{PT}$

$\begin{pmatrix} 2 \\ 6 \\ -2 \end{pmatrix}=K\begin{pmatrix} 6 \\ 18 \\ -6 \end{pmatrix}$

$2=6K,\ K=\frac{1}{3}$

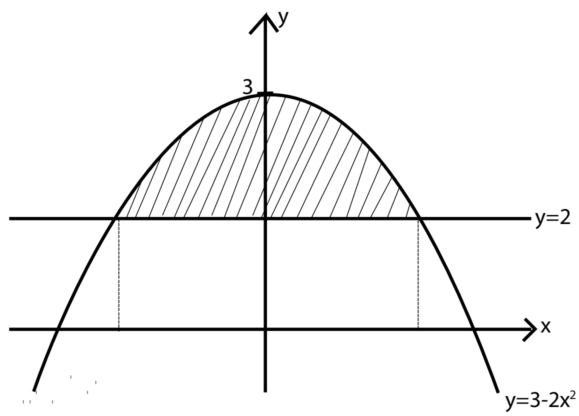
$6=18K,\ k=\frac{1}{3}$

$-2=-6,\ k=\frac{1}{3}$

$\Rightarrow \overrightarrow{PR}=\frac{1}{3}\overrightarrow{PT},\ \therefore$ PR and T are collinear.

(for $\overrightarrow{PR}=K\overrightarrow{PT}$ and conclusion)

8. Find the volume of solid generated when are area bounded by the curve $y = 3 - x^2$ and the line $y = 2$ is rotated about the line $y = 2$ to 3 significant figures. (05 marks)



at intersection

$2=3-x^2$

$x^2=\pm 1$

$V=\pi\int_{\infty}^{\infty} y^2 dx$

$V=\pi\int_{-1}^{1}(3-x^2-2)dx$

$V=\pi\int_{-1}^{1} 1-2x^2+x^2\varphi dx$

$V=\pi\left[x-\frac{2}{3}x^3+\frac{x^5}{5}\right]!$

$V=\pi\left[\left(1-\frac{2(+1)^3}{3}+\frac{(+1)^5}{5}\right)-\left((-1)-\frac{2(-1)^3}{3}+\frac{(-1)^5}{5}\right)\right]$

$=\frac{16}{15}\pi\ cubic\ units$

$=1.0667\pi\ cubic$

SECTION B: (60 MARKS)

*Answer any **five** questions from this section. All questions carry equal marks*

9. (a) In any triangle PQR, show that $\cos 2P + \cos 2Q + \cos 2R = -1 - \cos P \cos Q \cos R$.

LHS =COS2P+cos2Q+cos2R

=2cos(P+Q) cos(P-Q) +2cos²R-1

But P+Q+R=180°

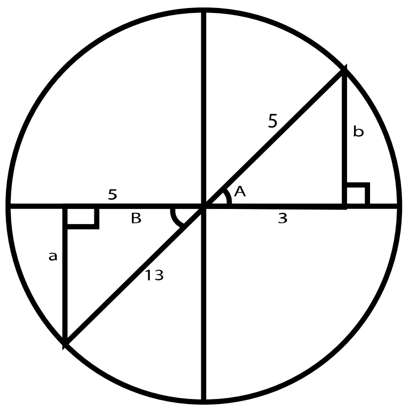
$P+Q=180° - R$

Cos(P+Q) =cos $(180° - \boldsymbol{R})$
Cos(P+Q) =-cosR
LHS =-2cosR cos(P-Q) +2cos²R-1
=-2cosR(cos(P-Q)-cosR)-1
=-2cosR (cos(P-Q) +cos(P+Q)-1
=-2cosR (2cosP cos(-Q))-1
=-4cosR cosP cosQ-1
=-1-4 cosP cosQ cosR

(b) A and B are angles of such that $\cos A = \frac{3}{5}$, and $\cos B = \frac{5}{13}$, if A is acute and B is reflex, without using tables or a calculator, find the values of:

i. $\tan 2A$

$a^2+(5)^2= (13)^2$
a=12
$(b)^2+(3)^2= (5)^2$
B=4
tan A=$\frac{4}{3}$
(ii) cos(A+B)
sinA=$\frac{4}{5}$
sinB=$\frac{12}{13}$
(i) tan2A=$\frac{2tanA}{1-tan^2A}$
$=\frac{2\left(\frac{4}{3}\right)}{1-\left(\frac{4}{3}\right)^2}$
$=\frac{24}{7}$



ii. $\cos(A + B)$ (12 marks)

cos(A+B) =cosA cosB-sinA sinB
$=\left(\frac{3}{5}\right).\left(\frac{5}{13}\right) - \left(\frac{4}{5}\right).\left(\frac{12}{13}\right)$
$=-\frac{33}{65}$

10.(a) Differentiate the following with respect to x:

i. $(\ln x)^x$

let y=$(\ln x)^{\ x}$
ln y=$x\ln(\ln x)$
$\frac{1}{y}\frac{dy}{dx}$=ln(ln$x$). 1+$x.\frac{1}{\ln(\ln x)}\ .\frac{1}{x}$
$\frac{1}{y}\ \frac{dy}{dx} = \mathbf{ln}(\boldsymbol{ln x}) + \frac{1}{\ln(\ln x)}$

$\frac{dy}{dx} = \left(ln(lnx) + \frac{1}{ln(lnx)}\right)(lnx)^{x}$

ii. 5^{x^2-1} (05 marks)

5^{x^2-1}

Let $y = 5^{x^2-1}$

$\ln y = (x^2-1)ln5$

$\frac{1}{y}\frac{dy}{dx} = 2xln5$

$\frac{dy}{dx} = 2x5^{x^2-1}ln5$

(b) A closed hollow right circular cone has internal height a and internal radius a. A solid circular cylinder of height h just fits inside the cone with the axis of the cylinder lying along the axis of the cone. Show that the volume of the cylinder is $\pi h(a - h)^2$. If a is fixed and h may vary, find h in terms of a when the volume of the cylinder is maximum. (07 marks)

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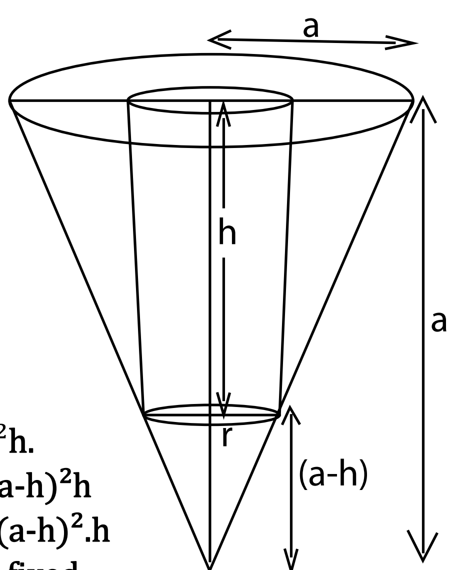


$\frac{a}{r} = \frac{a}{a-h}$

r=a-h

$V = \pi r^2 h.$

$V = \pi (a-h)^2 h$

$V = \pi h(a-h)^2.h$

a is fixed,

for mex, volume, $\frac{dv}{dh} = 0$

$\frac{dv}{dh} = \pi h.2(a-h)(-1) + (a-h)^2.\pi$

$= \pi(a-h)[-2h + a - h]$

$= \frac{\pi(a-h)(a-3h)}{\pi(a-h)(a-3h)=0}$

a-h=0, a-3h=0

h=a, $h = \frac{a}{3}$

at h=a

$V = \pi a(a-a)^2$

$V = 0$

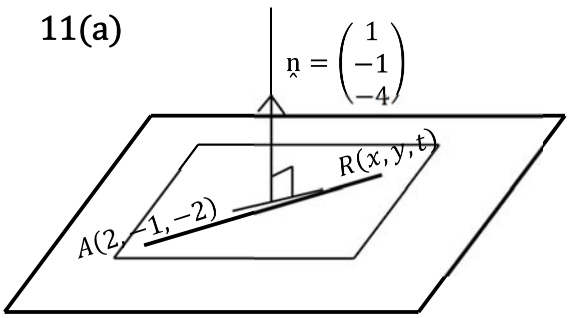
At h=$\frac{a}{3}$

V=$\pi\frac{a}{3}\cdot\left(a-\frac{a}{3}\right)^2$

V =$\frac{2a^3}{3}$ $\quad\therefore h=\frac{a}{3}$

11. (a) Find the equation of a plane which contains a point A (2,1, -2) and is parallel to the plane $x-y-4y=3$. (04 marks)

11(a)



$\overrightarrow{AR}\cdot\underset{\wedge}{n}=0$

$\overrightarrow{AR}=\overrightarrow{OR}-\overrightarrow{OA}$

$=\begin{pmatrix}x\\y\\z\end{pmatrix}-\begin{pmatrix}2\\1\\-2\end{pmatrix}$

$=\begin{pmatrix}x-2\\y-1\\z+2\end{pmatrix}$

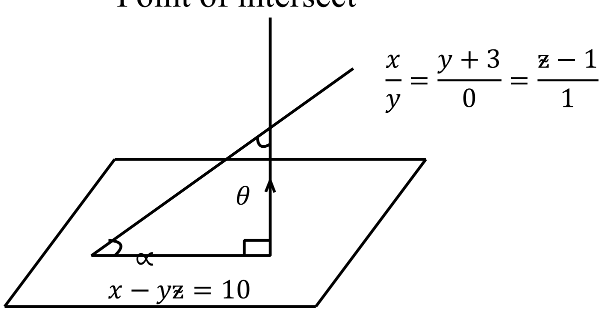
$=\begin{pmatrix}x-2\\y-1\\z+2\end{pmatrix}\cdot\begin{pmatrix}1\\-1\\-4\end{pmatrix}=0$

x-2-y+1-4z-8=0

x-y-4z=10

(b) If a line $\frac{x}{2}=\frac{y+3}{0}=\frac{z-1}{1}$ intersects with the plane in (a) above, find the:

Point of intersect



Let $\frac{x}{2}=\frac{y+3}{0}=\frac{z-1}{0}=x$

x= 2x, y=-3, z=x+1

2x-(-3)-4(x+1) =10

2x+3-4x-4=10

-2x=11

x=-$\frac{11}{2}$

x=2$\left(\frac{-11}{2}\right)$

=-11

y= -3

$\cancel{z}$=-$\frac{11}{2}$+1

$=-\frac{9}{2}$

the point is $\left(-11,-3,-\frac{9}{2}\right)$

i. Angle made between the line and plane. (08 marks)

$\underset{\wedge}{\underline{n}}.\underline{b}=/\underset{\wedge}{\underline{n}}/\underline{b}/\cos\theta$

$$\begin{pmatrix}1\\-1\\-4\end{pmatrix}.\begin{pmatrix}2\\0\\1\end{pmatrix}=\sqrt{(1)^2+(-1)^2+(-4)^2}\ \sqrt{(2)^2+(1)^2}\cos\theta$$

-2 = $\sqrt{18}\sqrt{5}\cos\theta$

$\theta=\cos^{-1}\left(\frac{-2}{\sqrt{90}}\right)$

$\theta=102.17$

$\propto+\theta=90°$

$\propto=90°-102.17°$

$\propto=-12.17°$

12.(a) Find the length of the latus rectum of the parabola $4x=t^2$ and $2y=t$.

4x=t^2, 2y=t

4x=(2y)^2

4x =4y^2

y^2 =x

from y^2 =4ax

4a =1unit

(b) The conic section below has eccentricity, $e<1$ and equation $\frac{x^2}{9}+y^2=1$. Find the value of e

$\frac{x^2}{9}$x$\frac{y^2}{1}$=1

a^2 = 9

a =3

b^2=1

b =1

for b^2=a^2$(1-e^2)$

$1^2=(3)^2(1-e^2)$

$\frac{1}{9}$=1-e^2

e^2=1-$\frac{1}{9}$

e^2= $\frac{8}{9}$

e =$\frac{2\sqrt{2}}{3}$

(c) find the equation of tangent to the hyperbola $x^2-9y^2=1$ at $P(\sec\beta,\frac{1}{3}\tan\beta)$

$x^2-ay^2=1$

2x-18y$\frac{dy}{dx}$=0

18y$\frac{dy}{dx}=2x$

$\frac{dy}{dx}=\frac{x}{9y}$

$\frac{sce\beta}{9\left(\frac{1}{3}tan\beta\right)}$

$\frac{1}{3sin\beta}$

Let (x,y)

$\frac{y-\frac{1tan\beta}{3}}{x-sec\beta} = \frac{1}{3\ sin\beta}$

3y sin$\boldsymbol{\beta} - \boldsymbol{tan\beta} = \boldsymbol{x} - \boldsymbol{sec\beta}$

x= 3y sin$\boldsymbol{\beta}$= x-tan$\boldsymbol{\beta}$ $\boldsymbol{sin\beta} + \boldsymbol{sec\beta}$

(12 marks)

13.Express $h(x) = \frac{2x^2+1}{(x-1)(x+2)}$ in to partial fractions and hence evaluate $\int_2^3 h(x)\, dx$, correct to three significant figures. (12 marks)

$\frac{2x^2+1}{(x-1)(x+2)} = \frac{2x^2+1}{x^2+x-2}$

$$x^2+x-2\overline{)\,2x^2+1\,}\quad 2$$

$-\frac{2x^2+2x-4}{-2x+5}$

$\frac{2x^2+1}{(x-1)(x+2)}$ $\mathbf{2} + \frac{-2x+5}{(x-1)(x+2)}$

So, $\frac{2x^2+5}{(x-1)(x+2)} \equiv \frac{A}{x-1} + \frac{B}{x+2}$

-2x+5 $\equiv \boldsymbol{A(x+2) + B(x-1)}$

When x= -2

9 = -3B

B = -3

$\frac{-2x+5}{(x-1)(x+2)} = \frac{1}{x-1} - \frac{3}{x+2}$

f(x)= 2+$\frac{1}{x-1}$ =$\frac{3}{x+2}$ $\int_0^1 \boldsymbol{f(x)\, dx} = \int_2^3 \boldsymbol{2dx} + \int_2^3 \frac{1}{x-1} \boldsymbol{dx}$ -$\int_2^3 \frac{3}{x+2} \boldsymbol{dx}$

=$[\boldsymbol{2x + In(x-1) - 3in(x+2)}]$

=(6+In2-3In5)-$(\boldsymbol{4 + In1 - 3In4})$

=2.0237

14.(a) The p^{th}, q^{th} and r^{th} terms of an Arithmetic progression are in a geometric progression, show that the ratio is $\frac{p-q}{q-r}$ or $\frac{q-r}{p-q}$. (06 marks)

Up= a+$\boldsymbol{(p-1)d, Uq = a + (q-1)d, Ur = a + (r-1)d}$

Ratio = $\frac{a+(q-1)d}{a+(q-1)d} = \frac{a+(r-1)d}{a+(q-1)d}$

$\boldsymbol{[a + (q-1)]d^2 = (a + (p-1)d)(a + (r-1)d)}$

a^2+2ad$\boldsymbol{(q-1) + d^2(q-1)^2 = a^2 + ad(r-1) + ad(p-1) + d^2(p-1)(r-1)}$

2adq-2ad+d^{2}q^2-2d^{2}q+d^2=adr-ad+ad(r-1) +ad(p-1) +d^2(p-1) (r-1)

2adq+d^{2}q^2-2d^{2}q=adr+adq+d^{2}pr-d^{2}p-d^{2}r

d^2(q^2-2q-pr+p+r) = ad(r+p-2q)

a = $\frac{(q^2-2q-pr+p+r)}{(r+p-2q)}$

Ratio $= \frac{(q^2-2q-pr+p+r)d+(q-1)d}{r+p-2q}$

$\frac{\overline{(q^2-2q-pr+p+r)d+(q-1)d}}{\overline{r+p-2q}}$

$=\frac{q^2-2q-pr+p+r+(q-1)(r+p-2q)}{q^2-2q-pr+p+r+(p-1)(r+p-2q)}$

$=\frac{q^2-2q-pr+p+r+qr+qp-2q^2-r-p+2q}{q^2-2q-pr+p+r+pr+p^2-2pq-r-p+2q}$

$=\frac{-q^2-pr+qr+qp}{q^2+p^2-2pq}$

$=\frac{qp-q^2+qr}{(p-q)^2}$

$=\frac{q(p-q)-r(p-q)}{(p-q)^2}$

$=\frac{(p-q)(q-r)}{(p-q)^2}$

$=\frac{q-r}{p-q}$

(b) The sum of n terms of a sequence is $S_n = 2^{2n} - n$ where n is a natural number. Find the first three terms of the sequence. (06 marks)

Sn = 2^2-n

For n=1,	n_2=2	n= 3
S_1 =2^2-1	S_2=2-2	S_2=2-3
S_1 =3	S_2=14	=61
U_1 =3	U_1+U_2 =14	$U_1+U_2+U_3$=61
	3+U_2=14	14+U_3=61
	U_2=11	U_3=47
	3,11,47----	

15. Show that the function $y = \frac{x^2-1}{x^2+4x}$ has no real stationary points and hence sketch the curve. (12 marks)

Y=$\frac{x^2-1}{x^2+4x}$

$\frac{dy}{dx}=\frac{(x^2+4x)(2x)-(x^2-1)(2x+4)}{(x^2+4x)}$

$\Rightarrow \frac{x^2+4x)(2x)-(x^2-1)(2x+4)=0}{(x^2+4x)^2}$

$2x^2$+$8x^2$-$(2x^3 - 4x^2 - 2x - 4) = 0$

$12x^2 + 2x + 4 = 0$

x= -2$\pm \frac{\sqrt{(2)^2-4(12)(4)}}{2(12)}$

x has no real roots, no turning point.

For x-intercepts, y=0

0=$\frac{x^2-1}{x^2+4x}$

$x^2 - 1 = 0$

x=± 1 (1,0), (-1,0)

y-intercept, x=0;

y =$\frac{-1}{0}$

= no y- intercept

Vertical

Asymptote

$x^2 + 4x = 0$

$x(x + 4) = 0$

x=0, x=-4

Horizontal asymptote

y=$\frac{x^2-1}{x^2+4x}$

y=$\frac{1-\frac{1}{x^2}}{1+\frac{4}{x}}$

$x \to \infty$

	-5	-2	-0.5	0.5	2
	$x < -4$	-4< $x < -1$	-1< $x < 0$	0< $x < 1$	x<
$x^2 - 1$	+	+	-	-	+
	+	-	-	+	+
	+	-	+	-	+

y=$\frac{(x-1)(x+1)}{x(x+4)}$

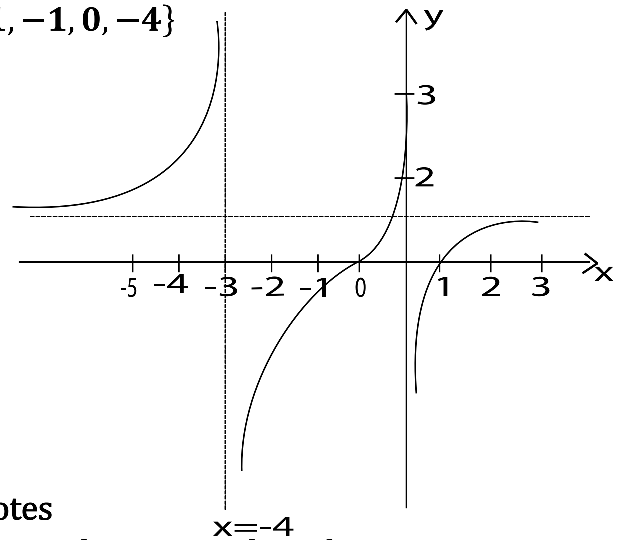
when y=1

1=$\frac{x^2-1}{x^2+4x}$

$x^2 + 4 = x^2 - 1$

x=-$\frac{1}{4}$

Uncritical valves $\{1, -1, 0, -4\}$



B1 for only asymptotes

B2 for all asymptotes and 2 curves plotted.

16.Solve the following differential equations:

a. $x^2 + y^2 - xy\frac{dy}{dx} = 0$

b. $x^3y\frac{dy}{dx} = x + 1$, for $y(1) = -2$. (12 marks)

$xy\frac{dy}{dx} = x^2 + y^2$

let $y = Vx$

$\frac{dy}{dx} = V.1 + x\frac{dv}{dx}$

$= V + \frac{xdv}{dx}$

$x.Vx\frac{dy}{dx} = x^2 + (Vx)^2$

$V\frac{dy}{dx}$=1+V^2

$\frac{dy}{dx} = \frac{1+V^2}{V}$

$V + x\frac{dv}{dx} = \frac{1+V^2}{V}$

$\frac{xdv}{dx} = \frac{1+v^2}{V} - V$

$\frac{xdv}{dx} = \frac{1}{v}$

$\int V dV = \int \frac{dx}{x}$

$\frac{V^2}{2} = lnx + c$

$\frac{y^2}{2x^2} = lnx + c$

OR

$\frac{V^2}{2} = lnx + lnA$

$\frac{y^2}{2x^2} = lnAx$

$y^2 = 2x^2 \ln Ax.$

(b)

$x^3 y\frac{dy}{dx} = x + 1$

$y\frac{dy}{dx} = \frac{x+1}{x^3}$

$y\, dy = \frac{1}{x^2} = \frac{1}{x^3} dx$

$\int y\, dy = \int \frac{1}{x^2} + \frac{1}{x^3}\ dx$

$\frac{y^2}{2} = \frac{-1}{x} - \frac{1}{2x^2} + c$

$y(1) = -2$

$\frac{(-2)^2}{2} = \frac{-1}{1} - \frac{1}{2} + c$

$2 = -\frac{-3}{2} + C$

$C = \frac{7}{2}$

$y^2 = \frac{-1}{x} - \frac{1}{2x^2} + \frac{7}{2}$

$x^2 y^2 = 2x - 1 + 7x^2$

END