Attendance Quiz

Name: Andrew Baxter

Solve
$$\begin{cases} x_1 + x_2 = 2 \\ x_1 y_1 + x_2 y_2 = 0 \\ x_1 y_1^2 + x_2 y_2^2 = 2 \\ x_1 y_1^3 + x_2 y_2^3 = 0 \end{cases}$$

Using Ramanujan's method.

From the system's right sides:
$$\begin{cases} a_1 = 2 \\ a_2 = 0 \\ a_3 = 2 \\ a_4 = 0 \end{cases}$$

Then $\phi(\theta) = 2 + 2\theta^2$ by (2)

and $\phi(\theta) = \dfrac{A_1 + A_2\theta}{1 + B_1\theta + B_2\theta^2}$ by (3)

Equating coefficients yields
$$\begin{cases} A_1 = a_1 \\ A_2 = a_2 + a_1 B_1 \\ 0 = a_3 + a_2 B_1 + a_1 B_2 \\ 0 = a_4 + a_3 \cdot B_1 + a_2 B_2 \end{cases}$$

Substituting a_i values yields

$A_1 = 2$, $A_2 = 0$

$B_1 = 0$, $B_2 = -1$

and so $\phi(\theta) = \dfrac{2}{1-\theta^2}$, which decomposes into

$$\frac{1}{1 - 1\theta} + \frac{1}{1 - (-1)\theta}$$

Thus $x_1 = 1$ $\quad x_2 = 1$

$y_1 = 1$ $\quad y_2 = -1$.

$$2 = \alpha(1+\theta) + \beta(1-\theta)$$

$$\theta = 1 \Rightarrow 2 = \alpha 2$$

$$\Rightarrow \alpha = 1$$

$$\theta = -1 \Rightarrow 2 = 2\beta$$

$$\beta = 1$$

$$\therefore \frac{x_1}{1-\theta y_1} + \frac{x_2}{1-\theta y_2} =$$

$$= \frac{1}{1-\theta} + \frac{1}{1+\theta}$$

$$\boxed{\begin{array}{l} x_1 = x_2 = 1 \\ y_1 = 1 \quad y_2 = -1 \end{array}}$$

Check:

$1 + 1 = 2$

$(1)(1) + (1)(-1) = 0$ ✓

!

$$2 = A_1$$

$$2B_1 = A_2$$

$$(2B_2 + 2) = 0$$

$$2B_2 = -2$$

$$\boxed{B_2 = -1}$$

$$\boxed{B_1 = 0} \Rightarrow \boxed{A_2 = 0}$$

$$\phi(\theta) = \frac{2}{1-\theta}$$

$$\frac{2}{1-\theta^2} = \frac{x_1}{1-\theta y_1} + \frac{x_2}{1-\theta y_2}$$

$$\frac{2}{(1-\theta)(1+\theta)} = \frac{\alpha}{1-\theta} + \frac{\beta}{1+\theta}$$

$$x_1 + x_2 = 2$$

$$x_1 y_1 + x_2 y_2 = 0$$

$$x_1 y_1^2 + x_2 y_2^2 = 2$$

$$x y_1^3 + x_2 y_2^3 = 0$$

$$\phi(\theta) = \frac{x_1}{1-\theta y_1} + \frac{x_2}{1-\theta y_2}$$

$$= a_1 + a_2\theta + a_3\theta^2 + \cdots$$

$$\phi(\theta) = \frac{A_1 + A_2\theta}{1 + B_1\theta + B_2\theta^2} = 2 + 2\theta^2$$

So $(1 + B_1\theta + B_2\theta^2)(2 + 2\theta^2) = A_1 + A_2\theta$

$$(2 + 2B_1\theta + 2B_2\theta^2 + 2\theta^2 + 2B_1\theta^3 + 2B_2\theta^4)$$

$$= A_1 + A_2\theta + 0\theta^2 + 0\theta^3$$

Attendance Quiz

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$\left[\ (y_1, y_2) = \pm(1,-1) \quad , \quad (x_1, x_2) = (1,1)\ \right]$

$$\alpha + \alpha\theta^2 = \frac{x_1}{1+y_1\theta} + \frac{x_2}{1+y_2\theta} = \frac{x_1+x_2 + x_1y_2\theta + x_2y_1\theta}{1 + y_1y_2\theta^2 + (y_1+y_2)\theta}$$

$$\cancel{(1 + (y_1+y_3)\theta + y_1y_3\theta^2)(\alpha + \alpha\theta^2) = 4 + 2(y_1+y_3)\theta}$$

$$(\alpha + \alpha\theta^2)(1 + (y_1+y_2)\theta + y_1y_2\theta^2) = (x_1+x_2) + (x_1y_2+x_2y_1)\theta$$

$\Rightarrow \alpha = x_1 + x_2$

$\alpha(y_1+y_2) = x_1y_2 + x_2y_1$

$\alpha + \alpha y_1y_2 = 0 \Rightarrow y_1 = -\frac{1}{y_2}$

$\alpha(y_1+y_2) = 0 \Rightarrow y_1+y_2 = 0 \Rightarrow y_1 = -y_2 = -\frac{1}{y_2} \Rightarrow y_2 = \pm 1$

$\Rightarrow y_1 = \mp 1$

$\cancel{(\alpha y_1 y_2 = 0?)}$

$x_1y_2 - x_2y_2 = 0 \Rightarrow x_1 = x_2 \Rightarrow x_1 = x_2 = 1$

Attendance Quiz

Name: Armin Straub
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Sol

$x_1 = 1 \quad x_2 = +1$

$y_1 = 1 \quad y_2 = -1$

$$x_1 + x_2 = 2$$
$$x_1 y_1 + x_2 y_2 = 0$$
$$x_1 y_1^2 + x_2 y_2^2 = 2$$
$$x_1 y_1^3 + x_2 y_2^3 = 0$$

$$\phi(\theta) = \frac{x_1}{1-\theta y_1} + \frac{x_2}{1-\theta y_2}$$
$$= a_1 + a_2\theta + a_3\theta^2 + a_4\theta^3 + \ldots$$
$$= 2 + 2\theta^2 + \ldots$$
$$= \frac{A_1 + A_2\theta}{1 + B_1\theta + B_2\theta^2}$$

linear sys: $(2 + 2\theta^2 + \ldots)(1 + B_1\theta + B_2\theta^2) = A_1 + A_2\theta$

$2 = A_1 \quad 2B_1 = A_2$

$2B_2 + 2 = 0 \quad 2B_1 = 0$

$\Rightarrow B_1 = A_2 = 0, \; A_1 = 2, \; B_2 = -1$

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

This was fun -!
Thanks, Doron

Name : N. Uday Kiran.
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$$\frac{A_1 + A_2\theta}{1+B_1\theta + B_2\theta^2} = 2+2\theta^2$$

$$\begin{aligned} A_1 + A_2\theta &= (2+2\theta^2)(1+B_1\theta + B_2\theta^2) \\ &= 2 + 2B_1\theta + 2B_2\theta^2 \\ &\quad + 2\theta^2 + 2B_1\theta^3 \\ &\quad + 2B_2\theta^4 \end{aligned}$$

$\Rightarrow \quad A_1 = 2, \quad A_2 = 2B_1, \quad \cancel{B_2 = 0}, B_1 = 0.$
$B_2 = -2.$

$$\cancel{\frac{2+0}{1} = \frac{2}{1+0\theta} + \frac{0}{1+0\theta}}$$

$$\cancel{x_1 = 2, \; x_2 = 0}$$
$$\cancel{y_1 = 0, \; y_2 = 0.}$$

$$\frac{2}{(1+\sqrt{2}\theta)(1-\sqrt{2}\theta)} = \frac{2+0}{1-2\theta^2} = \frac{1}{1+\sqrt{2}\theta} + \frac{1}{1-\sqrt{2}\theta}$$

$$x_1 = 1, \; x_2 = 1$$
$$y_1 = -\sqrt{2}, \; y_2 = +\sqrt{2}$$

Doron

GH Hardy

love to hate.

Mathematician Apology.

Attendance Quiz

Name ~~Ath~~ & Mint

$$\boxed{\begin{aligned} x_1+x_2&=2\\ x_1y_1+x_2y_2&=0\\ x_1y_1^2+x_2y_2^2&=2\\ x_1y_1^3+x_2y_2^3&=0 \end{aligned}}$$

~~θx_1~~

$$x_1+\theta x_1y_1+\theta^2x_1y_1^2+\theta^3x_1y_1^3 \to x_1\left(\frac{1-(\theta y_1)^3}{1-(\theta y_1)}\right)$$

$$x_2+\theta x_2y_2+\theta^2x_2y_2^2+\theta^3x_2y_2^3 \to x_2\left(\frac{1-(\theta y_2)^3}{1-\theta y_2}\right)$$

$$= 2+\theta^2 2.$$

Name: Ali K. Uren

$$x_1 + x_2 = 2$$
$$x_1 y_1 + x_2 y_2 = 0$$
$$x_1 y_1^2 + x_2 y_2^2 = 2$$
$$x_1 y_1^3 + x_2 y_2^3 = 0$$

$(x_1, x_2, y_1, y_2) = (1,1,1,-1)$

or

$= (1,1,-1,1)$

$$\frac{A_1 + A_2\theta}{1 + B_1\theta + B_2\theta^2} = 2(\cancel{1+\theta}) \Rightarrow A_1 + A_2\theta = 2 + (2B_1 + 2B_2) + B_2\theta^2 + \ldots$$

I have a copy of Ken's book, but I would love to have a physical copy of A=B.

L Kolitsch
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$$a_1 + a_2\theta + a_3\theta^2 + a_4\theta^3 + a_5\theta^4 = 2 + 2\theta^2 + a_5\theta^4 + \dots$$

$$\frac{A_1 + A_2\theta}{1 + B_1\theta + B_2\theta^2} = 2 + 2\theta^2 + a_5\theta^4 + \dots$$

$$A_1 + A_2\theta = (1 + B_1\theta + B_2\theta^2)(2 + 2\theta^2 + a_5\theta^4 + \dots)$$

$A_1 = 2$

$A_2 = 2B_1$

$2 + 2B_2 = 0$ $\qquad$ $B2 = -1$

$2B_1 = 0$ $\qquad$ $B1 = 0$

$2B_2 + a_5 = 0$ $\qquad$ $B2 = \frac{-a_5}{2}$

$$1 + B_1\theta + B_2\theta^2 = 1 - \theta^2$$
$$= (1 - \theta)(1 + \theta)$$

$y_1 = 1,\ y_2 = -1$ $\begin{pmatrix} x_1 = \\ x_2 = 1 \end{pmatrix}$ OR $y_1 = -1,\ y_2 = 1$ $(x_1 = x_2 = 1)$

[redacted]

$$x_1\left(1+y_1\theta+(y_1\theta)^2\right)+$$
$$x_2\left(1+y_2\theta+(y_2\theta)^2\right)=2(1+\theta^2)$$

$$\Rightarrow (x_1+x_2)+\theta(x_1y_1+x_2y_2)$$
$$+\theta^2(xy_1^2+y_2^2)=2(1+\theta^2)$$

$$\Rightarrow x_1=x_2=1$$
$$y_1=1,\ y_2=-1$$

[redacted] SARMA RISHABH, UF

D. Zeilberger's talk ATTENDANCE quiz

Note on a set of simultaneous eq^{n}s (Ramanujan, JIMS, 1912)

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Q
$$x_1+x_2=2$$
$$x_1y_1+x_2y_2=0$$
$$x_1y_1^2+x_2y_2^2=2$$
$$x_1y_1^3+x_2y_2^3=0$$

Sol^n:
$$x_1\left(1+y_1\theta+y_1^2\theta^2+y_1^3\theta^3\right)+$$
$$x_2\left(1+y_2\theta+y_2^2\theta^2+y_2^3\theta^3\right)=2+2\theta^2$$

~~or $(x_1+x_2)+\theta(x_1$~~

Or
$$x_1\frac{\left(1-(y_1\theta)^3\right)}{1-y_1\theta}+x_2\frac{1-(y_2\theta)^3}{1-y_2\theta}=2(1+\theta^2)$$

ATTENDANCE QUIZ

Name: Hunter Handley

$x_1 + x_2 = 2$

$x_1 y_1 + x_2 y_2 = 0$

$x_1 y_1^2 + x_2 y_2^2 = 2$

$x_1 y_1^3 + x_2 y_2^3 = 0$

$$\frac{x_1}{1-\theta y_1} + \frac{x_2}{1-\theta y_2} = a_1 + a_2\theta + a_3\theta^2 + a_4\theta^3$$

$$= \frac{x_1 - \theta y_2 x_1 + x_2 - \theta y_1 x_2}{1 - \theta(y_1+y_2) + \theta^2 y_1 y_2}$$

$\Downarrow$

$$x_1 + x_2 - \theta(y_2 x_1 + y_1 x_2) = (a_1 + a_2\theta + a_3\theta^2 + a_4\theta^3)(1 - \theta(y_1+y_2) + \theta^2 y_1 y_2)$$

$\Rightarrow x_1 + x_2 = 2$

$\therefore -(y_2 x_1 + y_1 x_2) = -2(y_1+y_2) + a_2$

$\therefore 0 = 2 + \ldots$

$\therefore 0 = 2 y_1 y_2 - a_4(y_1+y_2)$

$0 = a_4 y_1 y_2$

$\Downarrow$

$x_1 + x_2 = 2$

$\therefore +(y_2 x_1 + y_1 x_2) = 2(y_1+y_2)$

$\therefore 0 = 2 - 2(y_1+y_2) \Rightarrow 1 = y_1 + y_2$

$0 = 2 y_1 y_2$

so y_1 or y_2 is 0,

by symmetry, $y_1 = 0$ so $y_2 = 1$ and $x_1 + x_2 = 2$

$$x_1 + x_2 = 2$$

$$x y_1 + x_2 y_2 = 0$$

$$x_1 y_1^2 + x_2 y_2^2 = 2$$

$$x_1 y_1^3 + x_2 y_2^3 = 0$$

$x_1 = x_2 = 1$

$y_1 = 1, y_2 = -1$

Alladi

(INSPECTION)