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

and the prod. of (1) and (2) $= \dfrac{1-b}{1-a}$

$$\text{also, } \frac{x+1}{y+1} = \frac{1-b}{1-a}$$

hence the expression $= 0$.

4.
$$\begin{array}{r|l} -1 & 7 + 21 + 35 + 35 + 21 + 7 \\ & \quad -7 - 14 - 21 - 14 - 7 \\ \hline & 7 + 14 + 21 + 14 + 7 \\ -1 & \quad -7 - 7 - 7 \\ -1 & \qquad -7 - 7 - 7 \\ \hline & 7 + 7 + 7 \end{array}$$

$\therefore$ quotient is $7x^2 + 7xy + 7y^2$.

$$\begin{array}{r|l} -12 & 1 + 5 - 88 - 40 + 0 - 151 \\ & \quad -12 + 84 + 48 - 96 + 1152 \\ \hline & 1 - 7 - 4 + 8 - 96, \quad 1001 \end{array}$$

The value is $\therefore 1001$.

5. $18x^4 + 9x^3 - 17x^2 - 4x + 4$
$= (3x+2)(3x-2)(2x-1)(x+1)$;
$8x^4 + 4x^3 - 6x^2 - x + 1$
$= (2x+1)(2x-1)(2x-1)(x+1)$.

6. The first fraction should be $\dfrac{3}{4(1-x)^2}$

and the expression reduces to

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

7. If $a = 1$, the equality holds for all values of the quantities involved, and is therefore an identity.

8.
$$\frac{ab}{a+b},\ \frac{ac}{a+c},\ \frac{bc}{b+c}$$

will be in H. P. if their reciprocals are in A. P., that is, if

$$(1) \quad \frac{a+b}{ab} - \frac{a+c}{ac} = \frac{a+c}{ac} - \frac{b+c}{bc}$$

$$\text{if } \frac{1}{b} + \frac{1}{a} - \frac{1}{c} - \frac{1}{a} = \frac{1}{c} + \frac{1}{a} - \frac{1}{c} - \frac{1}{b}$$

$$\text{if } \frac{1}{b} - \frac{1}{c} = \frac{1}{a} - \frac{1}{b}$$

i. e., if $a, b, c,$ are in H. P.

$$(2) \quad \frac{b+c}{a},\ \frac{c+a}{b},\ \frac{a+b}{c}, \text{ are in A. P.}$$

$$\text{if } 2\,\frac{c+a}{b} = \frac{b+c}{a} + \frac{a+b}{c}$$

$$\text{if } 2\,\frac{c+a}{b} + 2 = \frac{b+c}{a} + 1 + \frac{a+b}{c} + 1$$

$$\text{if } 2\,\frac{a+b+c}{b} = \frac{a+b+c}{a} + \frac{a+b+c}{c}$$

$$\text{if } \frac{2}{b} = \frac{1}{a} + \frac{1}{c},$$

i. e., if $a, b, c,$ are in H. P.

9. Let c be the constant, connecting the area of each circle with the square of its radius; then the areas of the first two circles are each $9c$, and of the others $16c$, $25c$, $36c$, $49c$ respectively. The sum of these is $144c$, which is the area of a circle of radius 12.

10. If 11 is the first term, and d the common difference,

the sum of three terms $= 33 + 3d$,
and sum of nine terms $= 99 + 36d$;

equating these we get $d = -2$.

$\therefore$ the series is 11, 9, 7, 5, 3, 1 -1, -3, &c.

11. Let r be the common ratio; then the fifth term is $3r^4$,

$$\therefore r^4 = \frac{16}{81} \text{ and } r = \frac{2}{3} \text{ or } -\frac{2}{3}$$

The second value of r gives the series required.

12. $$\sqrt{1\cdot\dot{7}} = \sqrt{\frac{16}{9}} = \frac{4}{3} = 1\cdot\dot{3}.$$

13. (1) The sum of $2n$ terms

$$= (2a + 2nd)\frac{2n}{2}$$

$$\text{sum of } n \text{ terms} = (2a + nd)\frac{n}{2}$$

and the sum of the latter half of $2n$ terms is equal to the difference between these,

$$\therefore = (2a + 3nd)\frac{n}{2}$$

The sum of $3n$ terms of this series

$$= (2a + 3nd)\frac{3n}{2}$$

(2) First take n terms in each series;