Some expressions from alternate Rational Number Series

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Abstract

The author had submitted a paper on 'Rational Number Series'[1]. After this, papers on 'A few expressions from Rational Number Series'[2] and 'Some more expressions from Rational Number Series'[3] were submitted. Later, the Rational Number Series was looked at, in an alternate way. A few expressions were made with alternate Rational Number Series. These expressions are outlined in this paper.

Keywords

Expressions, rational number series, alternate rational number series;

Introduction

The expression $\frac{(mn+m-1)}{(mn+m)} - \frac{(mn-1)}{mn}$ was used to generate many expressions which are interesting. The papers 'A few expressions from Rational Number Series'[2] and 'Some more expressions from Rational Number Series'[3] have expressions based on $\frac{(mn+m-1)}{(mn+m)} - \frac{(mn-1)}{mn}$. Later $\frac{mn}{(mn+1)} - \frac{(mn-m)}{(mn-m+1)}$ (an alternate Rational Number Series) was tried. The expressions based on $\frac{mn}{(mn+1)} - \frac{(mn-m)}{(mn-m+1)}$ are presented in this paper.

Expression 1

$$\left(\frac{mn}{(mn+1)} - \frac{(mn-m)}{(mn-m+1)}\right) = \left(\frac{1}{(mn-m+1)} - \frac{1}{(mn+1)}\right)$$

Expression 2

$$\left(\frac{mn}{(mn+1)} - \frac{(mn-m)}{(mn-m+1)}\right) = \left(\frac{(mn-m)!}{(mn-m+1)!} - \frac{mn!}{(mn+1)!}\right)$$

Expression 3

$$\sum_{1}^{\infty}\left(\frac{mn}{mn+1} - \frac{mn-m}{mn-m+1}\right) = 1$$

Expression 4

$$\sum_{n=1}^{m}\left(\frac{mn}{(mn+1)}-\frac{(mn-m)}{(mn-m+1)}\right)=\frac{m^2}{1+m^2}$$

Expression 5

$$\sum_{n=1}^{m}\left(\frac{(mn)^k}{(mn+1)^k}-\frac{(mn-m)^k}{(mn-m+1)^k}\right)=\frac{m^k}{\sum_{l=0}^{k}\binom{k}{l}m^k}$$

Expression 6

$$x\int_{1}^{\infty}\left(\frac{xn}{(xn+1)}-\frac{(xn-x)}{(xn-x+1)}\right)dx+(x-2)\int_{1}^{\infty}\left(\frac{(x-2)n}{((x-2)n+1)}-\frac{((x-2)n-(x-2))}{((x-2)n-(x-2)+1)}\right)dx=x\int_{1}^{\infty}\frac{2}{(xn+1)(xn-1)}dx$$

Conclusion

In total six expressions have been submitted in this paper. The concept of Alternate Rational Number Series can be more widely used.

References

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