raised. It certainly is possible to introduce unusual terms into generating functions by the use of unusual operators.

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A FIGURATE NUMBER CURIOSITY: EVERY INTEGER IS A QUADRATIC FUNCTION OF A FIGURATE NUMBER

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In this note we prove the following: Every positive integer n can be expressed in an infinite number of ways as a quadratic function for each of the infinite number of figurate number types.

The nth figurate r-sided number p_n^r is given by

$$p_n^r = n\big((r-2)n - r + 4\big)/2, \tag{1}$$

where $n = 1, 2, 3, \ldots$ and $r = 3, 4, 5, \ldots$. Therefore, the snth figurate number is given by

$$p_{sn}^r = sn\big((r-2)sn - r + 4\big)/2. \tag{2}$$

However, (2) is a quadratic in n. Solving for n and taking the positive root yields

$$n = \frac{(r-4) + \sqrt{(r-4)^2 + 8(r-2)p_{sn}^r}}{2(r-2)s}, \tag{3}$$

which allows us to express n as stated above. A special case of (3) for pentagonal numbers ($r = 5$) was obtained by Hansen [1].

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