

# Mathematical concurrence concerning $\frac{x}{7^n}$

by

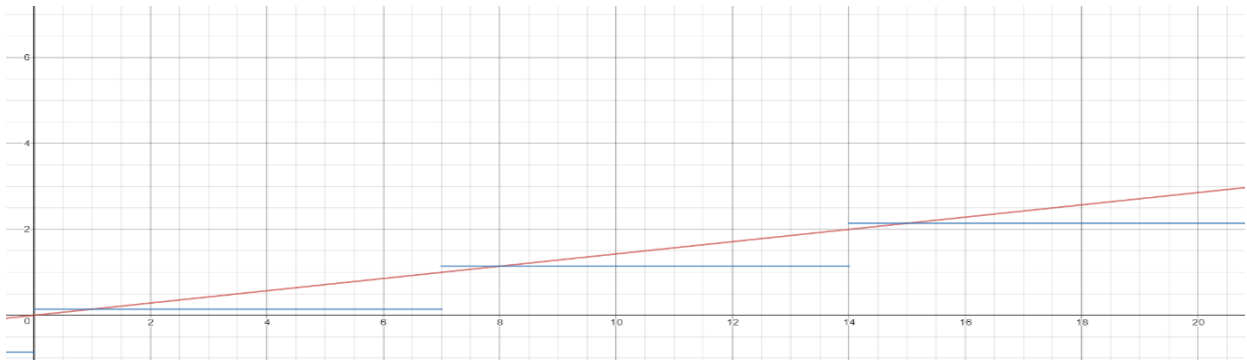
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## Abstract

In this combined work of mathematical concurrence, we present approximations for  $\frac{x}{7^n}$  in the form of infinite sums where  $x$  being 1 and being equal to  $\{y: y|7 + 1, y \in \mathbb{N}^+\}$ , consisting of mathematical constants i.e. Pi ( $\pi$ ), the Golden Ratio ( $\varphi$ ), the Silver Ratio ( $\delta_s$ ), Euler's number ( $e$ ) and Archimedes Constant ( $\sqrt{2}$ ).

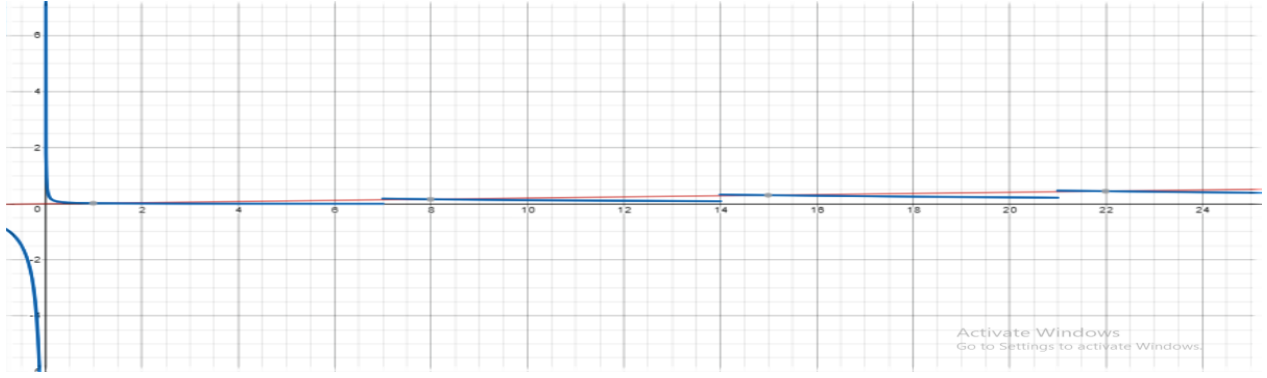
We have,

$$\frac{x}{7} \approx \left\lfloor \frac{x}{7} \right\rfloor + \pi - 3 \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (1)$$



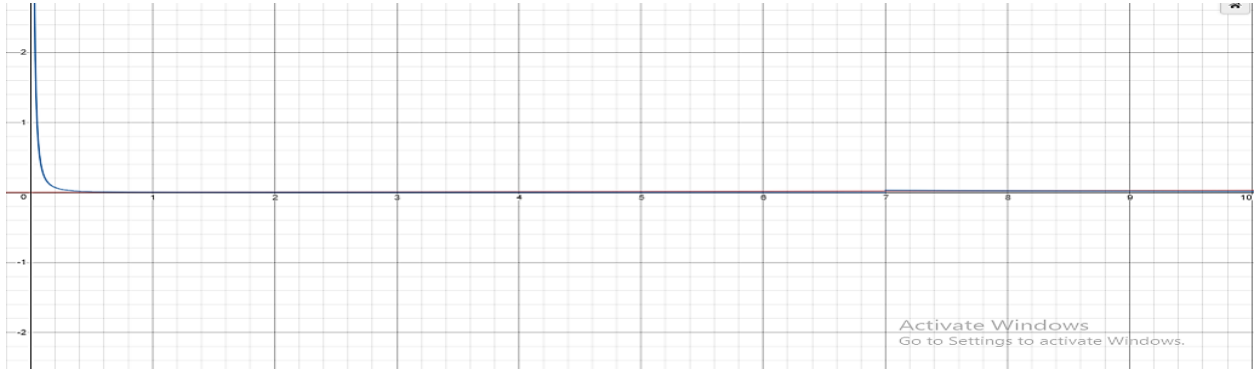
The above graph is for  $\frac{x}{7}$  (red) and  $\left\lfloor \frac{x}{7} \right\rfloor + \pi - 3$  (blue) where  $x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\}$

$$\frac{x}{49} \approx \frac{1}{x} \left[ \left\lfloor \frac{x}{7} \right\rfloor^2 + (\pi - 3) \left\{ \pi - 3 + 2 \left\lfloor \frac{x}{7} \right\rfloor \right\} \right] \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (2)$$



The above graph is for  $\frac{x}{49}$  (red) and  $\frac{1}{x} \left[ \left[ \frac{x}{7} \right]^2 + (\pi - 3) \left\{ \pi - 3 + 2 \left[ \frac{x}{7} \right] \right\} \right]$  (blue) where  $x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\}$

$$\frac{x}{343} \approx \frac{1}{x^2} \left[ \left[ \frac{x}{7} \right]^3 + (\pi - 3)^3 + (3\pi - 9) \left[ \frac{x}{7} \right] \left\{ \pi - 3 + \left[ \frac{x}{7} \right] \right\} \right] \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (3)$$



The above graph is for  $\frac{x}{343}$  (red) and  $\frac{1}{x^2} \left[ \left[ \frac{x}{7} \right]^3 + (\pi - 3)^3 + (3\pi - 9) \left[ \frac{x}{7} \right] \left\{ \pi - 3 + \left[ \frac{x}{7} \right] \right\} \right]$  (blue) where  $x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\}$

Thus, from the aforementioned relations, we can conclude that,

$$\frac{x}{7^n} \approx \frac{1}{x^{n-1}} \left\{ \left[ \frac{x}{7} \right] + \pi - 3 \right\}^n \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (4)$$

From (4), we get,

$$\frac{x}{7^n} \approx \sum_{n \geq i \geq 0} x \binom{n}{i} \left( \frac{\left[ \frac{x}{7} \right] + \pi - 4}{x} \right)^n \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (5)$$

Using the coincidence  $\pi \approx 2\delta_s \sqrt{\varphi} - 3$  (accurate upto 0.008%) and substituting in (1), (2), and (3), we get,

$$\frac{x}{7} \approx \left[ \frac{x}{7} \right] + 2\delta_s \sqrt{\varphi} - 6 \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (6)$$

$$\frac{x}{49} \approx \frac{1}{x} \left[ \left[ \frac{x}{7} \right]^2 + (4\delta_s\sqrt{\varphi} - 12) \left\{ \delta_s\sqrt{\varphi} - 3 + \left[ \frac{x}{7} \right] \right\} \right] \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (7)$$

$$\frac{x}{343} \approx \frac{1}{x^2} \left[ \left[ \frac{x}{7} \right]^3 + (2\delta_s\sqrt{\varphi} - 6)^3 + (2\delta_s\sqrt{\varphi} - 6) \left[ \frac{x}{7} \right] \left\{ 2\delta_s\sqrt{\varphi} - 6 + \left[ \frac{x}{7} \right] \right\} \right] \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (8)$$

Thus, from the aforementioned, we can conclude that,

$$\frac{x}{7^n} \approx \frac{1}{x^{n-1}} \left\{ \left[ \frac{x}{7} \right] + 2\delta_s\sqrt{\varphi} - 6 \right\}^n \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (9)$$

From (8), we get,

$$\frac{x}{7^n} \approx \sum_{n \geq i \geq 0} x \binom{n}{i} \left( \frac{\left[ \frac{x}{7} \right] + 2\delta_s\sqrt{\varphi} - 7}{x} \right)^n \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (10)$$

Using the coincidence  $\sqrt{2} \approx \left\{ \sqrt[3]{\sqrt[3]{(\delta_s)^2 + (\varphi)^2 + (\pi)^2 + (e)^2}} \right\} - \sum_{k=01}^{\infty} \left( \frac{2}{10^{2k}} \right)$

(accurate upto 0.0014%) and substituting in (5), we get,

$$\frac{x}{7^n} \approx \sum_{n \geq i \geq 0} \frac{x}{\pi} \binom{n}{i} \left\{ \frac{\pi \left[ \frac{x}{7} \right] + \left( \left( \sqrt{2} - \frac{2}{99} \right)^{4.5} \right)^2 - (e)^2 - (\varphi)^2 - (\delta_s)^2 - (2\sqrt{\pi})^2}{x} \right\}^n \leftrightarrow x = \{1, \{y: y|7 + 1, y \in \mathbb{N}^+\}\} \quad (11)$$

Substituting the coincidence

$$\pi^2 \approx \left[ \left\{ \sum_{10 \geq i \geq 01} \left( \ln \left( \varphi^{\frac{\varphi^i}{2i}} \right) \right) \right\} - \ln^2(\varphi) \right] - \frac{1}{100} \text{ (accurate up to 0.002\%)}$$

in (5), we obtain,

$$\frac{x}{7^n} \approx \sum_{n \geq i \geq 0} \sum_{10 \geq j \geq 01} \frac{x}{\pi} \binom{n}{i} \left\{ \frac{(10\sqrt{\pi})^2 \left[ \frac{x}{7} \right] + \ln \left( \varphi^{\frac{100\varphi^j}{2j}} \right) - \ln^2(\varphi) - (20\sqrt{\pi})^2 - 1}{100x} \right\}^n$$

From our observation we can conclude that, the greater the value of  $x$  in the L.H.S. be, the more accurate answer is yielded by the function at R.H.S.

## **References**

1. 'Mathematical coincidences concerning  $\pi$  and  $\sqrt{2}$ ' by Aditya Raj  
(<http://vixra.org/pdf/1901.0296v1.pdf>)