Think It Over

This section of *Resonance* presents thought-provoking questions, and discusses answers a few months later. Readers are invited to send new questions, solutions to old ones and comments, to 'Think It Over', *Resonance*, Indian Academy of Sciences, Bangalore 560 080. Items illustrating ideas and concepts will generally be chosen.

Some Identities in Algebra and Trigonometry

Prove the formal algebraic identity

$$\sum_{r=1}^n \frac{1}{2^r(1+x^{1/2^r})} = \frac{1}{1-x} - \frac{1}{2^n(1+x^{1/2^n})}. \quad (1)$$

For $0 < x < 1$, use the above identity to deduce that

$$\sum_{r=1}^{\infty} \frac{1}{2^r(1+x^{1/2^r})} = \frac{1}{1-x} - \frac{1}{1nx}. \quad (2)$$

Use the trigonometric identity

$$\lim_{n \rightarrow \infty} 2^n \prod_{r=1}^n \cos\left(\frac{x}{2^r}\right) = \frac{\sin x}{x} \quad (3)$$

to give another proof of the above infinite series identity.

G N Chandwani

Senior Secondary School

Sector-X, Bhilai 490 006

India.

Email: gopichandchandwani@gmail.com

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Algebraic identity, trigonometric identity.