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Theorem. *If x and y are odd integers then $x + y$ is an even integer.*

Proof. We assume that x and y are odd integers and will prove that $x + y$ is an even integer. Since x and y are odd, there exist integers m and n such that $x = 2m + 1$ and $y = 2n + 1$. By substitution and algebra we obtain

$$\begin{aligned} x + y &= 2m + 1 + 2n + 1 \\ &= 2m + 2n + 2 \\ &= 2(m + n + 1). \end{aligned}$$

Define $q = m + n + 1$. Since m and n are integers and the integers are closed under addition, we conclude that q is an integer. Since $x+y = 2q$ for the integer q we conclude that $x + y$ is an even integer. □

Challenge Typing

Suppose that $f : (-1, 1) \to \mathbb{R}$ and f is differentiable at 0. Let sequences $(\alpha_n)_{n\geq 1}$ and $(\beta_n)_{n\geq 1}$ satisify $-1 < \alpha_n < \beta_n < 1$ for all $n \geq 1$ and $\lim\limits_{n\to\infty} \alpha_n = \lim\limits_{n\to\infty} \beta_n = 0$. Set

$$\lambda_n = \frac{f(\beta_n) - f(\alpha_n)}{\beta_n - \alpha_n}.$$