

TABLE 3-1 Wave functions, zeroes, and infinities of plane wave functions in rectangular coordinates

Wave type	Wave functions	Zeroes of wave functions	Infinities of wave functions
Traveling waves	$e^{-j\beta x}$ for $+x$ travel $e^{+j\beta x}$ for $-x$ travel	$\beta x \rightarrow -j\infty$ $\beta x \rightarrow +j\infty$	$\beta x \rightarrow +j\infty$ $\beta x \rightarrow -j\infty$
Standing waves	$\cos(\beta x)$ for $\pm x$ $\sin(\beta x)$ for $\pm x$	$\beta x = \pm(n + \frac{1}{2})\pi$ $\beta x = \pm n\pi$ $n = 0, 1, 2, \dots$	$\beta x \rightarrow \pm j\infty$ $\beta x \rightarrow \pm j\infty$
Evanescent waves	$e^{-\alpha x}$ for $+x$ $e^{+\alpha x}$ for $-x$ $\cosh(\alpha x)$ for $\pm x$ $\sinh(\alpha x)$ for $\pm x$	$\alpha x \rightarrow +\infty$ $\alpha x \rightarrow -\infty$ $\alpha x = \pm j(n + \frac{1}{2})\pi$ $\alpha x = \pm jn\pi$ $n = 0, 1, 2, \dots$	$\alpha x \rightarrow -\infty$ $\alpha x \rightarrow +\infty$ $\alpha x \rightarrow \pm\infty$ $\alpha x \rightarrow \pm\infty$
Attenuating traveling waves	$e^{-\gamma x} = e^{-\alpha x} e^{-j\beta x}$ for $+x$ travel $e^{+\gamma x} = e^{+\alpha x} e^{+j\beta x}$ for $-x$ travel	$\gamma x \rightarrow +\infty$ $\gamma x \rightarrow -\infty$	$\gamma x \rightarrow -\infty$ $\gamma x \rightarrow +\infty$
Attenuating standing waves	$\cos(\gamma x) = \cos(\alpha x) \cosh(\beta x)$ $-j \sin(\alpha x) \sinh(\beta x)$ for $\pm x$ $\sin(\gamma x) = \sin(\alpha x) \cosh(\beta x)$ $+j \cos(\alpha x) \sinh(\beta x)$ for $\pm x$	$\gamma x = \pm j(n + \frac{1}{2})\pi$ $\gamma x = \pm jn\pi$ $n = 0, 1, 2, \dots$	$\gamma x \rightarrow \pm j\infty$ $\gamma x \rightarrow \pm j\infty$

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