→ gamma function difined everything Except non-positive integers
defined for positive real nos
Gamma function: $\int_0^\infty e^{-x} x^n dx$

→ Converts function real variablet to a function Complex Variable s (in some cases imaginary part is 0)

Advantage of Laplace.

→ Turns Differential equation into algebraic equation and Convolution into multiplication in laplace domain

→ e^{t^2}, tant → not exponential order

→ Piecewise cont. on $[0, \infty)$

→ S-Shifting theorem - Shifting happens in S domain

→ Transform of derivative → same thing as above.

-> This can be extended for n^{th} order derivative.

-> initial value problems

is a differential equation along with an appropriate initial condition

Unit Step function

-> Also called as Heaviside function
-> Discont function
-> 0 for neg arg.

Ex. Voltage switched on / off.
For calculations it is periodic. (specify interval)

-> Unit step function is bounded. but its not stable because the absolute integral is infinite.

Dirac Delta.

auxiliary function $g(t-a) = \begin{cases} 1/h & a < t < a+h \\ 0 & \text{otherwise.} \end{cases}$

$$\delta(t-a) = \lim_{h \to 0} g(t-a).$$

→ Dirac Delta is not a function, as it has nothing to do with real line and everything to do with what occurs if we integrate it against another function.

Convolution Theorem

-> Geometrical → area
-> Physical → Amount.

→ Convolution is a mathematical operation on two function that produces a third function expressing how the shape of one is modified by the other.

-> imp digital Signal Processing.

-> commutative, distributive, associative

Periodic function.

→ $f(x+T) = f(x)$ $T \rightarrow$ non zero positive

Fourier Transform

→ To find difficult Integral.

→ If the period used in c to $c+2\pi$ is infinity fourier series changes to fourier Transform.

tion

Series.

Fourier Series → Expansion of unfamilies function in terms of T basic periodic functions.

→ The fourier Transform is an important image procession tool which is used to decompose an image into its Sine and Cosine components.

→ Fourier Transform decomposes any function into sum of basic simple sinusoids.

→ Self reciprocal or Hankel transform

Transform of derivative

If $f(t)$ is Cont. $f'(t)$ is ~~pwc~~ piecewise continuously differentiable, $f(t)$, $f'(t)$ are absolutely integrable in $(-\infty, \infty)$ and $\lim_{t \to \pm\infty} f(t) = 0$ then

$$F\{f'(t)\} = (is)\, F(s)$$