TAYLOR'S & LAURENT'S SERIES

Important Question Bank

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Important Questions

1) Show that Every finite value of z is,

$$e^z = e + e\sum \frac{(z-1)^n}{n!}.$$

2) Expand the function $f(z) = \dfrac{\sin z}{z-\pi}$ about $z=\pi$

3) Find possible Laurent's Expansion of funct^n

$$f(z) = \frac{2-z^2}{z(1-z)(2-z)} \quad \text{about } z=0,$$

indicating the ROC in each case.

4) Find Laurent's Series which represents the function $f(z) = \dfrac{2}{(z-1)(z-2)}$, when

(i) $|z|<1$ (ii) $1<|z|<2$ (iii) $|z|>2$.

5) Expand $f(z) = \dfrac{1}{z^3-3z^2+2z}$ as Laurent's Series about $z=0$ for, (i) $|z|<1$

(ii) $1<|z|<2$

(iii) $|z|>2$.

6) Find all possible Laurent's expansions of $f(z) = \dfrac{z^3-6z-1}{(z-1)(z-3)(z+2)}$, about $z=3$.

Also indicate region of convergence.

7) Obtain Taylor's and Laurent's expansions of $f(z) = \dfrac{z-1}{z^2-2z-3}$, indicating ROC's.

8) Expand $f(z) = \dfrac{1}{z^2(z-1)(z+2)}$, about $z=0$

for (i) $|z|<1$ (ii) $1<|z|<2$ (iii) $|z|>2$.

9) Obtain Taylor's and Laurent's Series for $f(z) = \dfrac{2z-3}{z^2-4z-3}$ in powers of $(z-4)$ indicating Region of convergence.

10) Find all possible Laurent's Expansion of function, $f(z) = \dfrac{7z-2}{z(z-2)(z+1)}$ about $z=-1$.

11) Find all possible Laurent's Expansion of $f(z) = \dfrac{z}{(z-1)(z-2)}$, about $z=-2$.

12) Obtain the Laurent's series with valid region of convergence, where

$$f(z) = \frac{(z-2)(z+2)}{(z+1)(z+4)}, \text{ for (i) } 1 < |z| < 4$$

(ii) $|z| > 4$.

13) Expand $f(z) = \dfrac{1}{z(z+1)(z-2)}$, (i) within the unit circle about the origin.

(ii) within the annulus region between the concentric circles about the origin having radii 1 and 2 respectively.

(iii) In the exterior of circle with centre at the origin and radius 2.

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