Series

Saturday, August 20, 2022 3:43 PM

$(x^2-1)y'' + 2x y' + 6y = 0$

$\Rightarrow y'' + \frac{2x}{x^2-1} y' + \frac{6}{x^2-1} = 0$

at $x = \pm 1$, there exists singularity points.

$(x^2+1)y'' + xy' - y = 0$

at $x = \pm i$,

Assignment : solve $(x^2+1)y'' + xy' - y = 0$

Assignment : Regular or irregular singular point

$p(x) = (x - x_0) P(x) \to$ if valid, regular

$q(x) = (x - x_0)^2 Q(x)$

$(x^2-4)^2 y'' + 3(x-2)y' + 5y = 0$

$\Rightarrow y'' + 3\frac{\cancel{(x-2)}}{(x+2)^2\cancel{(x-2)}^{2\ 1}} + \frac{5}{(x+2)^2(x-2)^2} y = 0$

$P(x) = \frac{3}{(x+2)^2(x-2)}$ $\quad Q(x) = \frac{5}{(x+2)^2(x-2)^2}$

$x = \pm 2$ singular

for, $x = +2$,

$p(x) = (x-2) \cdot \frac{3}{(x+2)^2(x-2)}$

$= \frac{3}{(x+2)^2}$

$q(x) = (x-2)^2 \cdot \frac{5}{(x+2)^2(x-2)^2}$

$= \frac{5}{(x+2)^2}$

... point

$$= \frac{\quad}{(x+2)^2}$$

$\therefore$ $x = +2$ is a regular singular point

$x = -2$,

$$p(x) = (x+2)\frac{3}{(x+2)^2(x-2)} \qquad q(x) = (x+2)^2 \cdot \frac{5}{(x+2)^2(x-2)^2}$$

$=$ undefined

$x = -2$ is irregular singular point.

Example 2 Assignment #2