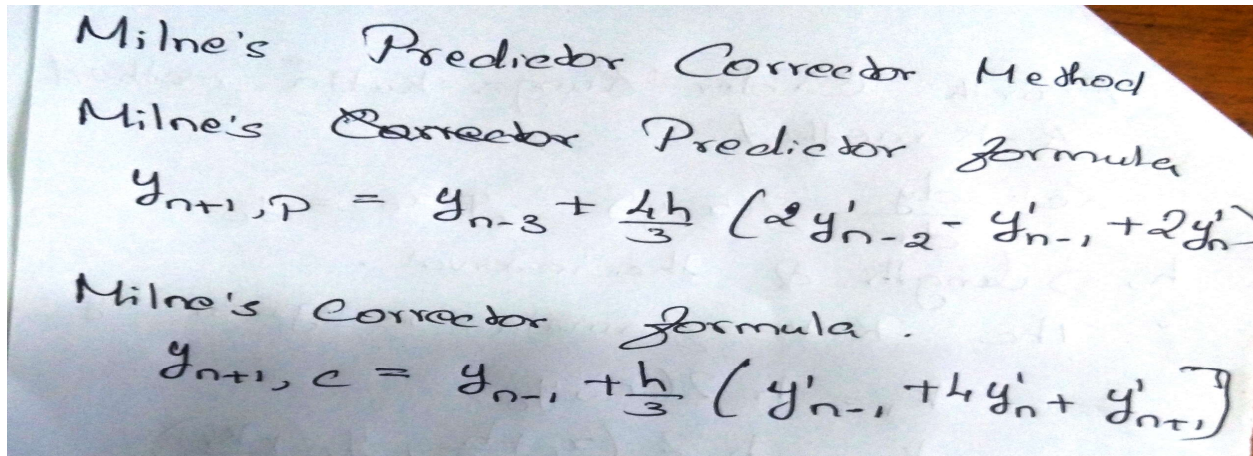




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Topic: 5.10 – Milnes Predictor Corrector Formula



PREDICTOR - CORRECTOR METHODS

PREDICTOR FORMULA :

$$y_{n+1,p} = y_{n-3} + \frac{4h}{3} (2y'_{n-2} - y'_{n-1} + 2y'_n)$$

CORRECTOR FORMULA

$$y_{n+1,c} = y_{n-1} + \frac{h}{3} (y'_{n-1} + 4y'_n + y'_{n+1})$$



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2. Using Milne's predictor-corrector method, find $y(4.4)$ given:
 $5xy' + y^2 - 2 = 0$; $y(4) = 1$, $y(4.1) = 1.0069$, $y(4.2) = 1.0097$, $y(4.3) = 1.0143$
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Soln:

Milne's predictor-corrector formula is

$$y_{n+1,p} = y_{n-3} + \frac{4h}{3} (2y'_{n-2} - y'_n + 2y'_n)$$

$$y_{n,p} = y_n + \frac{4h}{3} (2y'_1 - y'_2 + 2y'_3) \quad \text{--- (1)}$$

Given $5xy' + y^2 - 2 = 0$, $x_0 = 4, x_1 = 4.1, x_2 = 4.2, x_3 = 4.3$
 $5xy' = 2 - y^2$, $y_0 = 1, y_1 = 1.0049, y_2 = 1.0097,$
 $y' = \frac{2 - y^2}{5x}$, $y_3 = 1.0143$

$$y'_1 = \frac{2 - y_1^2}{5x_1} = \frac{2 - (1.0049)^2}{5(4.1)} = 0.0493$$

$$y'_2 = \frac{2 - y_2^2}{5x_2} = \frac{2 - (1.0097)^2}{5(4.2)} = 0.0467$$

$$y'_3 = \frac{2 - y_3^2}{5x_3} = \frac{2 - (1.0143)^2}{5(4.3)} = 0.0452$$

Sub all these values in (1),

$$y_{4,p} = 1 + \frac{4(0.1)}{3} [2(0.0493) - 0.0467 + 2(0.0452)]$$

$$= 1.01897$$

$$y'_{4,p} = \frac{2 - y_{4,p}^2}{5(x_4)} = \frac{2 - (1.01897)^2}{5(4.4)} = 0.0437$$

Using Milne's corrector formula,

$$y_{4,c} = y_2 + \frac{h}{3} [y'_2 + 4y'_3 + y'_{4,p}]$$

$$= 1.0097 + \frac{0.1}{3} [0.0467 + 4(0.0452) + 0.0437]$$

$$y_{4,c} = 1.01874$$

$$\therefore \boxed{y(4.4) = 1.01874}$$