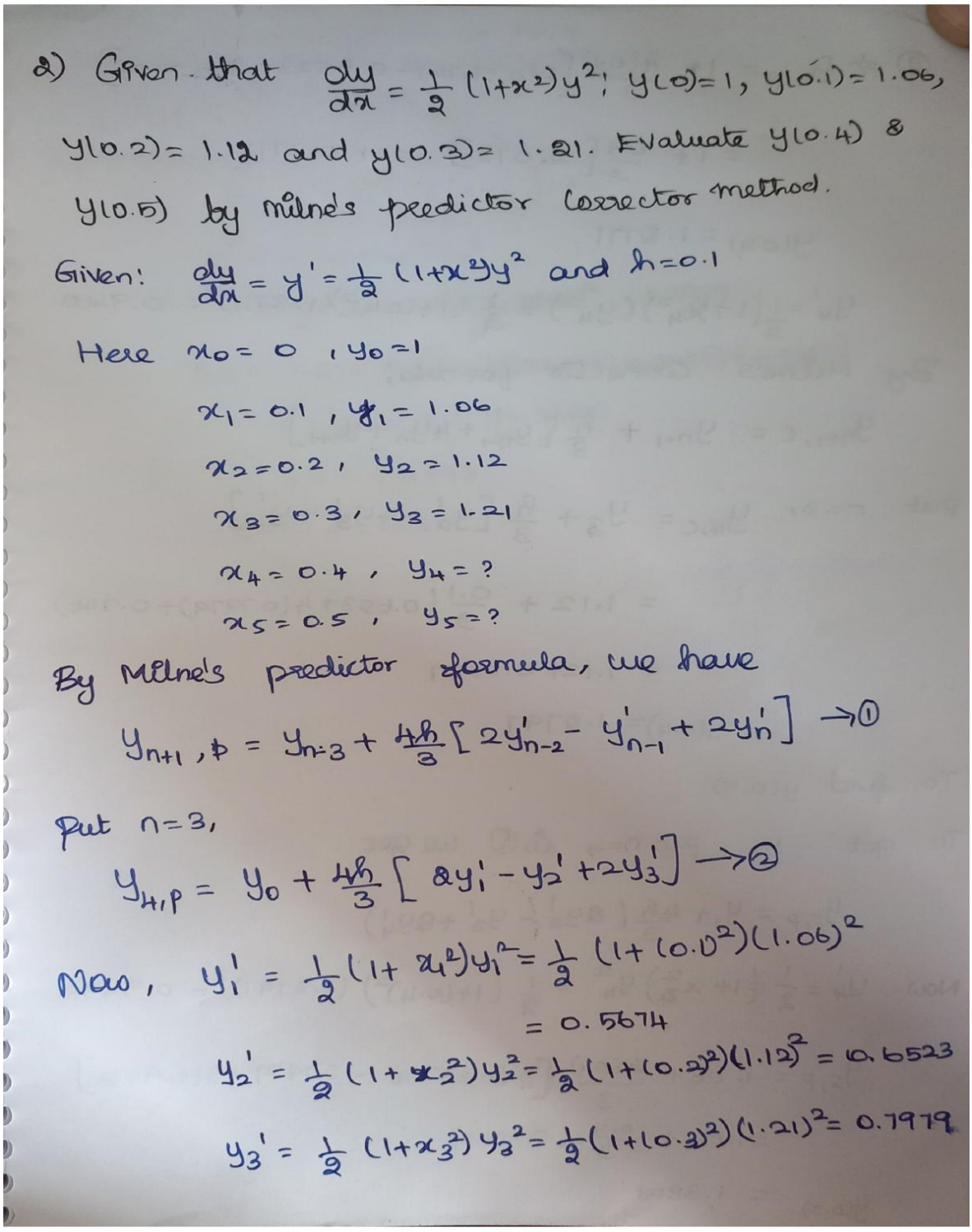
UNIT 5NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATION
MILNE'S PREDICTOR CORRECTOR METHOD FOR SOLVING 1ST ORDER EQUATIONS



a) Given that $\frac{dy}{dx} = \frac{1}{2}(1+x^2)y^2$; $y(0)=1$, $y(0.1)=1.06$, $y(0.2)=1.12$ and $y(0.3)=1.21$. Evaluate $y(0.4)$ & $y(0.5)$ by milne's predictor corrector method.

Given: $\frac{dy}{dx} = y' = \frac{1}{2}(1+x^2)y^2$ and $h=0.1$

Here $x_0 = 0$, $y_0 = 1$

$x_1 = 0.1$, $y_1 = 1.06$

$x_2 = 0.2$, $y_2 = 1.12$

$x_3 = 0.3$, $y_3 = 1.21$

$x_4 = 0.4$, $y_4 = ?$

$x_5 = 0.5$, $y_5 = ?$

By Milne's predictor formula, we have

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

Put $n=3$,

$$y_{4,p} = y_0 + \frac{4h}{3}[2y'_1 - y'_2 + 2y'_3] \rightarrow (2)$$

Now, $y'_1 = \frac{1}{2}(1+x_1^2)y_1^2 = \frac{1}{2}(1+(0.1)^2)(1.06)^2$

$= 0.5674$

$y'_2 = \frac{1}{2}(1+x_2^2)y_2^2 = \frac{1}{2}(1+(0.2)^2)(1.12)^2 = 0.6523$

$y'_3 = \frac{1}{2}(1+x_3^2)y_3^2 = \frac{1}{2}(1+(0.3)^2)(1.21)^2 = 0.7979$

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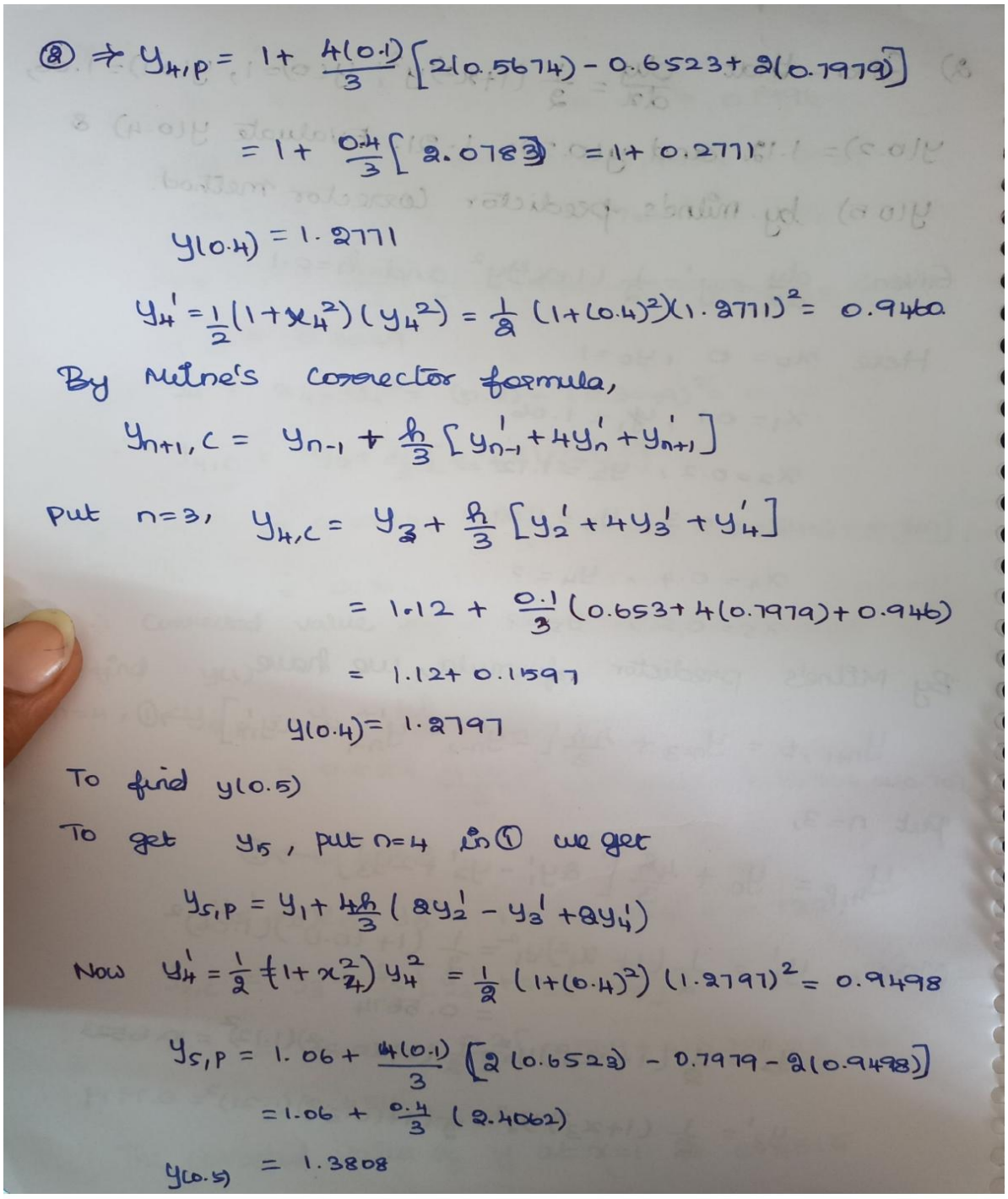

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