$f: A \longrightarrow A$ then $x \in A$ is a fixed point for f if f(x) = x. $\cdot \quad x_{m+1} = f(x_m)$

y(x) = y, + f(+, 8(+)) dt (Thanks to FTC). y, (x) = y0 + f f (6, 30) dt

 $y_3(x) = y_0 + \int_{x_0}^{x} f(b, y_1(b)) dt$ 33(2) = 30 + 5 (1,3,4) dt yn(z) = 30 + St(t, yn,(4)) dt - Picands approximation.

Remark. Under the assumptions of existence & uniqueness theorems, the reg. {In} converges to the volution y.

Cinen Eso J MOEIN B.t.

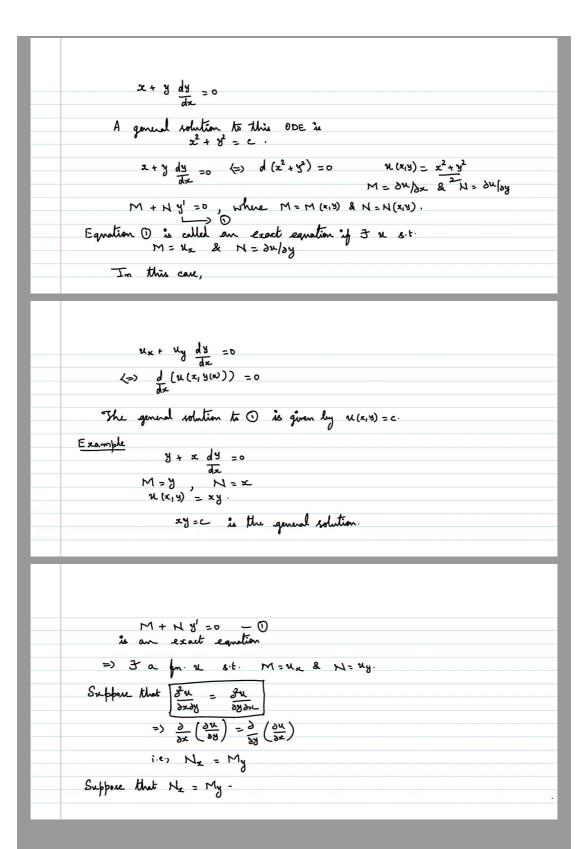
1 yn (2) - y(2) < E + m> no

Ner no depende only on E and not on the fit. 'x'

Example

y'=y; y(x)=1.

xo=0, yo=1, f(x,y)=y. $y_{1} = 1 + \int_{0}^{2} f(t, \Delta) dt = 1 + \int_{0}^{2} \int_{0}^{2} dt = 1 + 2$ $y_{2} = 1 + \int_{0}^{2} f(t, 1 + b) dt = 1 + \int_{0}^{2} (1 + b) dt = 1 + 2 + 2^{2}$ $y_{3} = 1 + \int_{0}^{2} f(t, 1 + 2 + 2^{2}) dt = 1 + \int_{0}^{2} 1 + 2^{2} dt = 1 + 2 + 2^{2} + 2^{2}$ $\frac{1}{3} = \sum_{k=0}^{n} \frac{k_k}{k!} \longrightarrow e^{\frac{1}{2}}.$



Aim. To find u such that $u_x = M & u_y = N$.

If $u_x = M$ $(=) u(x,y) = \int M(x,y) dx + h(y) . \longrightarrow \textcircled{3}$ $\frac{\partial u}{\partial y} = \frac{\partial}{\partial y} \left(\int M(x,y) dx + h(y) \right)$ $= \frac{\partial}{\partial y} \left(\int M(x,y) dx \right) + h'(y) = \int M_y dx + h'(y)$ $= \int h'(y) = u_y - \int M_y dx . \longrightarrow \textcircled{3}$ This expression is meaningful if RHS is independent of x.

i.e., $\frac{\partial}{\partial x} \left(u_y - \int M_y dx \right) = 0$

i.e., Nx - My =0

But this is our assumption.

Thus 3 is always meaningful and hence we can use it to find h.

Now the required a can be found using (2).

Theorem Suppose that M&N have cts. 1st order fantial derivatives, then the

M + N y = == in exact (=> My = Nx