comswere to the g. NO-01(a)

Giiven,

$$f(x) = x^3 + x^7 - 4x - 4$$

$$\therefore x^3 + x^7 - 4x - 4 = 0$$

$$\Rightarrow x^7 (x+1) - 4 (x+1) = 0$$

$$\Rightarrow (x+1) (x^7 - 4) = 0$$

$$\Rightarrow (x+1) (x+2) (x-2) = 0$$

Herre,

erte,

$$\chi+1=0$$
 And,
 $\chi+2=0$ $\chi-2=0$
 $\Rightarrow \chi=-2$ $\Rightarrow \chi=2$

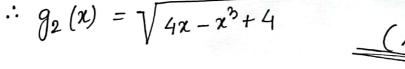
Now,
$$\chi^3 + \chi^7 - 4\chi - 4 = 0$$

$$\Rightarrow 4\chi = \chi^3 + \chi^7 - 4$$

$$\Rightarrow \chi = \frac{\chi^3 + \chi^7 - 4}{4}$$

$$\therefore g_1(\chi) = \frac{\chi^3 + \chi^7 - 4}{4}$$

Again, $x^3 + x^7 - 4x - 4 = 0$ $\Rightarrow \chi^{\gamma} = -\chi^3 + 4\chi + 4$ $\Rightarrow \chi = \sqrt{-\chi^3 + 4\chi + 4}$



(Am:) [P. T. 0]

Am. to the g. NO - 01 (b)

From previous part (a),

We get,

$$g_1(x) = \frac{x_+^3 + x_-^2 + 4}{4}$$

$$\therefore g_1'(x) = \frac{1}{4} \left(3x_+^2 + 2x\right)$$

And,

$$g_{2}(x) = \sqrt{4x - x^{3} + 4}$$

$$\Rightarrow g_{2}'(x) = \frac{4 - 3x^{2}}{2(4x - x^{3} + 4)^{1/2}}$$

Now, for
$$g_1(x)$$
:
$$\lambda = \left| g_1(x) \right|$$

$$= \left| \frac{3x^2 + 2x}{4} \right|$$

$$\chi_{*} = -1$$
, $\eta = 0.25 \Rightarrow linearc$
convergence

 $\chi_{*} = -2$, $\eta = 2 \Rightarrow Divergence$
 $\chi_{*} = 2$, $\eta = 4 \Rightarrow Divergence$

:
$$g_1(x)$$
 is linearly converging to $x_* = -1$

x3+ 1= 4x-4=0

x-x2 [= (8) 2 3

PEXPERIMEN

X = 1-2-19X+4

[P.T.O]



And,

forc 92(2):

 $= \frac{\left|g_{2}'(x)\right|}{\left|\frac{\chi_{*}=-1, \ \eta=0.5\Rightarrow \text{ linear convergence}}{\text{convergence}}\right|}$ $= \frac{\left(4-3x^{2}\right)}{2\left(4x-x^{3}+4\right)^{1/2}} \quad \chi_{*}=2, \ \eta=2 \Rightarrow \text{ Divergence}$ $\chi_{*}=2, \ \eta=2 \Rightarrow \text{ Divergence}$ $\lambda = \left| g_2'(x) \right|$

 $g_2(x)$ is linearly converging $\Rightarrow x = -1$

(Am:)

communer to the g. NO-02(a)

Given,

$$f(x) = xe^{x} - 1$$

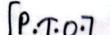
$$\Rightarrow f'(x) = xe^{x} + e^{x}$$

_			
	K	\varkappa_{K}	f(2/K)
	0	1.500	5.722
	1	0.9893	1.660
	2	0.6789	0.3385
	3	0.5766	0.03633
	4	0.5672	1.567×10-4
	5	0.5671	-1·196×10 ⁻⁴

$$\chi_{K+1} = \chi_{K} - \frac{f(\chi_{K})}{f'(\chi_{K})}$$

: Solution of
$$f(x) = 0 - 3 is 0.5671$$

(Ams)





Given,
$$g(x) = \frac{2x+1}{\sqrt{x+1}}$$

We need to show that,

to be superlinearly convergent,

$$x^* = -3/2$$
;

$$\therefore g'(x^*) = 0$$

$$g'(-3/2)=0$$

Now,
$$g(x) = \frac{2x+1}{\sqrt{x+1}}$$

$$= \frac{2x+1}{(x+1)^{1/2}}$$

$$= (2x+1)(x+1)^{-1/2}$$

$$\Rightarrow g'(x) = \frac{d}{dx} \left[(2x+1)(x+1)^{-1/2} \right]$$

$$u = 2x+1$$

and,

$$V = (\chi + 1)^{-3/2}$$

 $\Rightarrow V' = -\frac{1}{2} (\chi + 1)^{-3/2}$

P. M. O.

Νοω,

$$g'(x) = u'v + uv'$$

$$= 2(x+1)^{-1/2} + (2x+1)(-1/2)(x+1)^{-3/2}$$

$$= \frac{2}{\sqrt{x+1}} - \frac{2x+1}{2(x+1)^{3/2}}$$

Νοω,

$$g'(\alpha) = \frac{2 \cdot 2 \cdot (\alpha + 1)^{3/2}}{\sqrt{\alpha + 1} \cdot 2 \cdot (\alpha + 1)^{3/2}} - \frac{2\alpha + 1}{2(\alpha + 1)^{3/2}}$$

$$= \frac{4(\alpha + 1)^{3/2}}{2(\alpha + 1)^{3/2}} - \frac{2\alpha + 1}{2(\alpha + 1)^{3/2}}$$

$$= \frac{4(\alpha + 1) - (2\alpha + 1)}{2(\alpha + 1)^{3/2}}$$

$$= \frac{4\alpha + 4 - 2\alpha - 1}{2(\alpha + 1)^{3/2}}$$

$$= \frac{2\alpha + 3}{2(\alpha + 1)^{3/2}}$$

Now

evaluating
$$g'(x)$$
 at $x^* = -3/2$:

$$g'(-\frac{3}{2}) = \frac{2 \cdot (-\frac{3}{2}) + 3}{2(-\frac{3}{2} + 1)^{\frac{3}{2}}}$$

$$=\frac{-3+3}{2\cdot(-1/2)^{3/2}}$$

$$= \frac{0}{2(-1/2)^{3/2}}$$

$$\therefore g'\left(-\frac{3}{2}\right) = 0$$

: the fixed point itercation using
$$g(x) = \frac{2x+1}{\sqrt{x+1}}$$
 will be superclinearly convergent to $x^* = -3/2$.

cdms. to the g. NO - 03 (a)

Given function,

$$f(x) = x^3 - x^7 - 3x + 2$$

We Know,

Newton-Raphson method's formula: \ x = 2.000

$$\chi_{n+1} = \chi_n - \frac{f(\chi_n)}{f'(\chi_n)}$$

Where f'(x) = 0; (not near a turing point

Now, avoiding the turning points,

for root: (1):
$$x = -1.618$$

avoiding turning point at $\alpha = -0.721$, choosing an interval from left, [-2,1]

> At contains the root, x = -1.618; away from the twoning point out and poilis

Twening points:

 $\chi = 1.387$

for ποοτ: (3): α = 0.6180

avoiding both twening point x=-0.721 herce, and x = 1.387;

but choosing an interval between them, [0,1]

It contains $\alpha = 0.6180$; away from the given turning points.

fore root: (3): x = 2.000

herce, avoiding the turning point at x = 1.387, choosing an intereval in its right: [1.5, 2.5] puincul- guibien

At contains x = 2.000 and away from the turning point, x = 1.387.

: The correct intervals, including the roots it contains, avoiding the turning points are :

[-2,-1], [0,1], [1.5,2.5]

(Am:)

coms. to the g. NO-03(b)

Yes,

"this can be solved using the Guasi Newton method.

It is a numerical method as like Newton-Raphson method; but this Quasi Newton method has some different characteristics. This Quasi-Newton method prevents direct computation of the derivative; most importantly the turning points; where $f'(\alpha) = 0$; and where we are unable to calculate the next point; on in cases of "Math error".

Hence, it can be said that, this can be solved using the Quasi-Newton method.