Program FIXED PT

**Program Objective:** To solve an equation of the form \( f(x) = 0 \) by fixed point iteration

**Program Description:** The equation \( f(x) = 0 \) is solved implicitly for \( x \) to yield \( x = g(x) \). The function \( g(x) \) is the basis for the iteration: \( x_{n+1} = g(x_n) \). The resulting sequence of iterates converges to a unique fixed point on an interval \([a, b]\) if - \( g: [a, b] \to [a, b] \) and - \( |g'(x)| < 1 \) \( \forall x \in [a, b] \)

**User Instructions:**
1. Store the function \( g(x) \) in \( y_1 \) using \[ y = \]
2. Select the program FIXED PT for EXECution using \[ PRGM \]
3. Upon prompting, user supplies - \( X \): the initial guess \( x_0 \), - \( T \) for tolerance \( 10^{-t} \) and - \( N \) for the maximum number of iterations

**Platform:** Texas Instruments Graphing Calculator TI83/84 (plus)

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**Program Listing**

```plaintext
:Prompt X,T,N
:ClrHome
:For(I,1,N,1)
:y_1(X) = W
:If(abs(W - X) < 10^-T)
:Then
:Output(5,1,"X=")
:Output(5,3,Round(W,T))
:Output(6,1,"ITNS=")
:Output(6,6,I)
:Stop
:Else
:W - X
:End
:End
:Output(5,1,"TOL NOT MET IN")
:Output(6,1,N)
:Output(7,1,"ITNS=")
:Stop
```

**Command Location, remarks**

- `PRGM I/O`
- `PRGM I/O`
- `PRGM Ctl`
- `VARS YVARS FUNCTION 1 , STO`
- `PRGM Ctl`
- `2nd TEST`
- `PRGM Ctl`
- `PRGM I/O`
- `PRGM I/O`
- `Math NUM`
- `PRGM I/O`
- `PRGM I/O`
- `PRGM Ctl`
- `STO`
- `PRGM Ctl`
- `PRGM Ctl`
- `PRGM Ctl`
- `PRGM Ctl`
- `PRGM Ctl`
- `PRGM I/O`
- `PRGM I/O`
- `PRGM I/O`
- `PRGM Ctl`