**Algorithm & Example-1 *f*(*x*)=*x*3-*x*-1 Newton Raphson method to find root of the equation**

**Algorithm**

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| --- | --- |
| **Newton Raphson method Steps (Rule)** | |
| **Step-1:** | Find points *a* and *b* such that *a*<*b* and *f*(*a*)⋅*f*(*b*)<0. |
| **Step-2:** | Take the interval [*a*,*b*] and find next value *x*0=*a*+*b/*2 |
| **Step-3:** | Approximating Taylor series  Let x0 is guess value of the root  f(x1)=f(x0) +f’(x0)(x1-x0)  if x1 is root then f(x1)=0  Find *f*(*x*0) and *f*′(*x*0) *x*1=*x*0-*f*(*x*0)/*f*′(*x*0) |
| **Step-4:** | If *f*(*x*1)=0 then *x*1 is an exact root, else *x*0=*x*1 |
| **Step-5:** | Repeat steps 2 to 4 until *f*(*xi*)=0 or |xk+1-xk|≤Accuracy |

**xample-1**  
**Find a root of an equation *f*(*x*)=*x*3-*x*-1 using Newton Raphson method**  
  
**Solution:**  
Here *x*3-*x*-1=0  
  
Let *f*(*x*)=*x*3-*x*-1  
  
∴*f*′(*x*)=3*x*2-1  
  
Here

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*** | 0 | 1 | 2 |
| ***f*(*x*)** | -1 | -1 | 5 |

Here *f*(1)=-1<0and*f*(2)=5>0  
  
∴ Root lies between 1 and 2  
  
*x*0=1+2/2=1.5  
  
  
1*st* iteration :  
  
*f*(*x*0)=*f*(1.5)=0.875  
  
*f*′(*x*0)=*f*′(1.5)=5.75  
  
*x*1=*x*0-*f*(*x*0)*f*′(*x*0)  
  
*x*1=1.5-0.875/5.75  
  
*x*1=1.34783  
  
  
2*nd* iteration :  
  
*f*(*x*1)=*f*(1.34783)=0.10068  
  
  
  
*x*2=*x*1-*f*(*x*1)*f*′(*x*1)  
  
*x*2=1.34783-0.100684.44991  
  
*x*2=1.3252  
  
  
3*rd* iteration :  
  
*f*(*x*2)=*f*(1.3252)=0.00206  
  
  
*x*3=*x*2-*f*(*x*2)*f*′(*x*2)  
  
*x*3=1.3252-0.002064.26847  
  
*x*3=1.32472  
  
  
4*th* iteration :  
  
*f*(*x*3)=*f*(1.32472)=0  
  
  
*x*4=*x*3-*f*(*x*3)*f*′(*x*3)  
  
*x*4=1.32472-04.26463  
  
*x*4=1.32472