$$H_n = \sum_{k=1}^{n} \frac{1}{k}$$

1: 1.0	50: 4.499205338329423
2: 1.5	100: 5.187377517639621
3: 1.8333333333333333	150: 5.591180588643881
4: 2.083333333333333	200: 5.878030948121446
5: 2.283333333333333	250: 6.100675249432579
6: 2.4499999999999997	300: 6.282663880299502
7: 2.5928571428571425	350: 6.436576710542007
8: 2.7178571428571425	400: 6.5699296911765055
9: 2.8289682539682537	450: 6.6875739472545765
10: 2.9289682539682538	500: 6.79282342999052
11: 3.0198773448773446	550: 6.888042758555136
12: 3.103210678210678	600: 6.974978421969597
13: 3.180133755133755	650: 7.054957061321836
14: 3.251562326562327	700: 7.1290101155912335
15: 3.3182289932289937	750: 7.197955389950435
16: 3.3807289932289937	800: 7.2624522623611485
17: 3.439552522640758	850: 7.323040134339779
18: 3.4951080781963135	900: 7.380165880900755
19: 3.547739657143682	950: 7.434203872949501
20: 3.597739657143682	1000: 7.485470860550343

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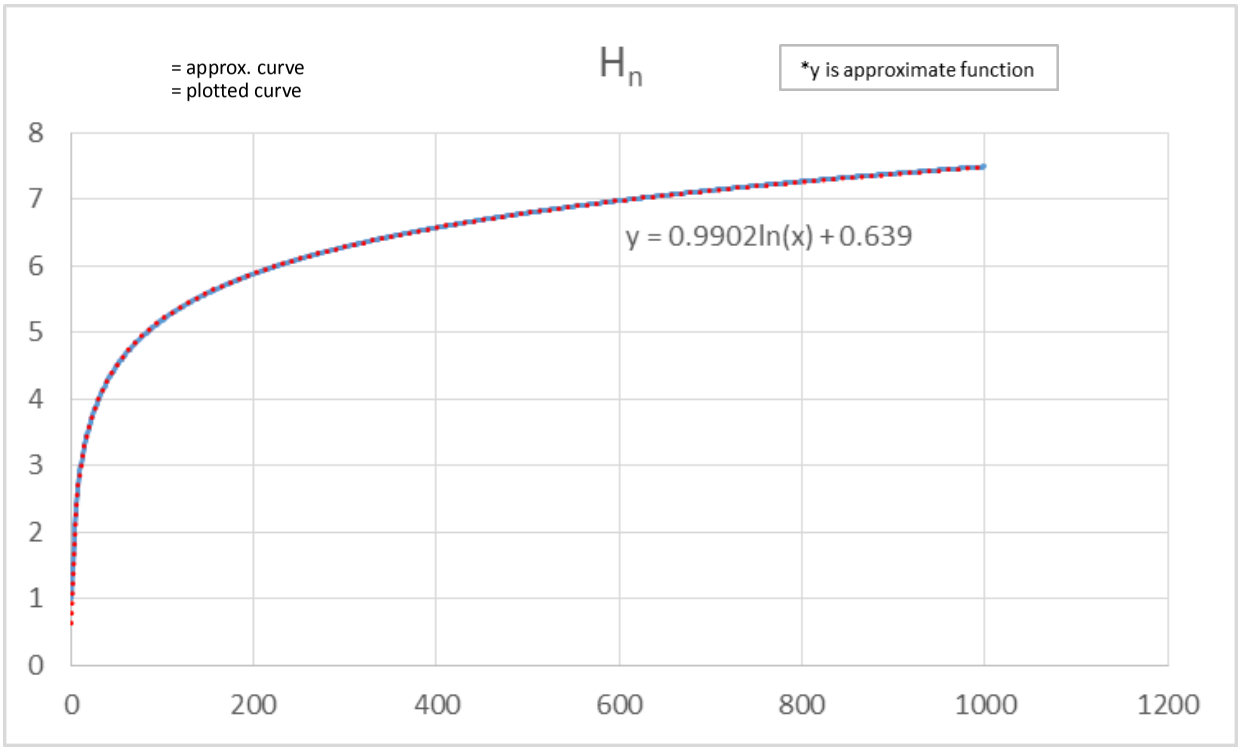


```java
public class cs182_1
{
    public void summation()
    {
        for(int i = 1 ; i < 1001 ; i++)
        {
            double sum = 0 ;
            for(int j = 1 ; j <= i ; j++)
            {
                sum += 1.00/j ;
            }
            System.out.println("" + i + ": " + sum) ;
        }
    }
```

$$\log n! = \sum_{k=1}^{n} \log k$$

1: 0.0	50: 64.48307487247203
2: 0.3010299956639812	100: 157.97000365471575
3: 0.7781512503836436	150: 262.75689341092607
4: 1.380211241711606	200: 374.8968886400403
5: 2.0791812460476247	250: 492.50958639546155
6: 2.857332496431268	300: 614.4858030437734
7: 3.702430536445525	350: 740.0919742162324
8: 4.605520523437469	400: 868.8064141777256
9: 5.559763032876794	450: 1000.2388909583985
10: 6.559763032876794	500: 1134.086408535134
11: 7.601155718035019	550: 1270.1068512561585
12: 8.680336964082644	600: 1408.1022869662777
13: 9.79428031638948	650: 1547.9078708720172
14: 10.940408352067719	700: 1689.3841813336087
15: 12.1164996111234	750: 1832.4117549371485
16: 13.320619593779325	800: 1976.8870842376327
17: 14.5510685151576	850: 2122.719619214308
18: 15.806341020260906	900: 2269.8294761838106
19: 17.085094621213734	950: 2418.1456570491423
20: 18.386124616877716	1000: 2567.6046442221304

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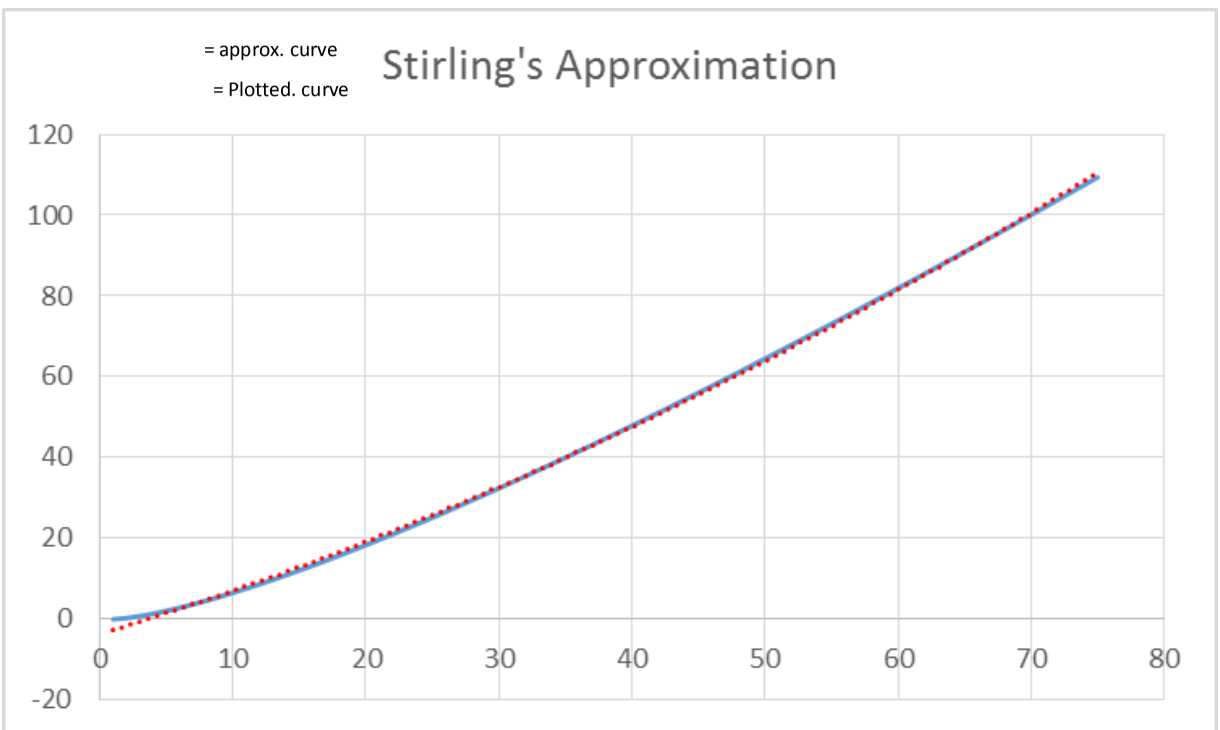


```java
public class cs182_1
{
    public void summation()
    {
        for(int i = 1 ; i < 1001 ; i++)
        {
            double sum = 0 ;
            for(int j = 1 ; j <= i ; j++)
            {
                sum += Math.log10(j) ;
            }
            System.out.println("" + i + ": " + sum) ;
        }
    }
```