

>
Infinite series and integral test.

#12, Section 11.2

> **a:=n->5/2^n-1/3^n;**

$$a := n \rightarrow \frac{5}{2^n} - \frac{1}{3^n}$$

> **a(4);**

$$\frac{389}{1296}$$

> **evalf(%);**

0.3001543210

> **a(.37);**

3.202926428

> **limit(a(n),n=infinity);**

0

> **sum(a(n),n=0..6);**

$$\frac{392963}{46656}$$

> **evalf(%);**

8.422560871

> **evalf(sum(a(n),n=0..20));**

8.499995232

> **evalf(sum(a(n),n=0..30));**

8.499999995

> **evalf(sum(a(n),n=0..50));**

8.500000000

> **sum(a(n),n=0..infinity);**

$$\frac{17}{2}$$

Harmonic series.

> **b:=n->1/n;**

$$b := n \rightarrow \frac{1}{n}$$

> **evalf(sum(b(n),n=1..100));**

5.187377518

> **evalf(sum(b(n), n=1..200));**
5.878030948

> **evalf(sum(b(n), n=1..500));**
6.792823430

> **evalf(sum(b(n), n=1..1000));**
7.485470861

> **evalf(sum(b(n), n=1..10000));**
9.787606036

> **evalf(sum(b(n), n=1..1000000));**
14.39272672

See how close this is to the estimate from integral test.

> **evalf(log(1000001));**
13.81551156

> **evalf(log(1000000)+1);**
14.81551056

> **evalf(sum(b(n), n=1..100000000));**
21.30048150

Another example.

> **c:=n->1/n^2;**
$$c := n \rightarrow \frac{1}{n^2}$$

> **sum(c(n), n=1..infinity);**
$$\frac{\pi^2}{6}$$

> **evalf(%);**
1.644934068

> **f:=x->1/x^2;**
$$f := x \rightarrow \frac{1}{x^2}$$

> **int(f(x), x=1..infinity);**
1

#22, Section 11.3

> **d:=n->1/(n*(1+log(n)^2));**

$$d := n \rightarrow \frac{1}{n(1 + \log(n)^2)}$$

> **sum(d(n),n=1..infinity);**

$$\sum_{n=1}^{\infty} \frac{1}{n(1 + \ln(n)^2)}$$

> **evalf(%);**

$$\sum_{n=1}^{\infty} \frac{1}{n(1 + \ln(n)^2)}$$

> **evalf(sum(d(n),n=1..50));**

1.910242086

> **evalf(sum(d(n),n=1..100));**

1.946291880

> **evalf(sum(d(n),n=1..200));**

1.973436017

> **evalf(sum(d(n),n=1..500));**

2.000376529

> **evalf(sum(d(n),n=1..1000));**

2.016139062

> **evalf(sum(d(n),n=1..5000));**

2.043021738

> **evalf(sum(d(n),n=1..10000));**

2.051745458

> **g:=x->1/(x*(1+log(x)^2));**

$$g := x \rightarrow \frac{1}{x(1 + \log(x)^2)}$$

> **int(g(x),x=1..infinity);**

$$\frac{\pi}{2}$$

> **evalf(%);**

1.570796327

> **evalf(%)+1;**

2.570796327

> **evalf(sum(d(n),n=1..50000));**

2.067733438

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