January 15

SWBAT:

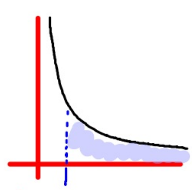
Apply the integral test to determine if a series converges or diverges

$$\int_1^\infty \frac{1}{x^p}\,dx$$

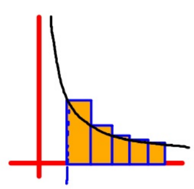
converge if $p > 1$

diverge if $p \leq 1$

$$\int_1^\infty \frac{1}{x}\,dx$$



diverge



Int	height	width	Area
$1 \to 2$	$\frac{1}{1} = 1$	1	1
$2 \to 3$	$\frac{1}{2}$	1	$\frac{1}{2}$
$3 \to 4$	$\frac{1}{3}$	1	$\frac{1}{3}$

$$1 + \frac{1}{2} + \frac{1}{3} + \cdots + \frac{1}{n} + \cdots$$

$$\sum_{n=1}^\infty \frac{1}{n}$$

Diverge

$$\sum_{n=1}^{\infty} \frac{1}{n^p}$$

converge if $p>1$

diverge if $p \le 1$

Harmonic series ($p=1$)

$\sum_{n=1}^{\infty} \frac{1}{n}$ diverges

P-series

Converge

$$\sum_{n=1}^{\infty} \frac{1}{n^6}$$

$$\sum_{n=1}^{\infty} \frac{n+3}{n^3-7}$$

$$\sum_{n=1}^{\infty} \frac{5}{n^4} = 5\sum_{n=1}^{\infty} \frac{1}{n^4}$$

Diverge

$$\sum_{n=1}^{\infty} \frac{1}{n^{-2}} \qquad \sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$$

$$\sum_{n=1}^{\infty} \frac{1}{2n^{-3}} = \frac{1}{2}\sum \frac{1}{n^{-3}}$$

$$\sum_{n=1}^{\infty} \frac{n^4-n^2+7}{n^2-10}$$

$$\sum_{n=1}^{\infty} n^2 = \sum_{n=1}^{\infty} \frac{1}{n^{-2}}$$

Integral Test

Let $a_n = f(n)$

where $f(x)$ is positive, decreasing and continuous for $x \geq 1$

If $\int_1^\infty f(x)\,dx$ converges,

then $\sum_{n=1}^{\infty} a_n$ converges

If $\int_1^\infty f(x)\,dx$ diverges

then $\sum_{n=1}^{\infty} a_n$ diverges