Infinite Series:

The only infinite series that have a sum are

Geometric Series when |r|<1

To find the sum of an infinite geometric series if |r|<1, use the following formula:

$$S = \frac{a_1}{1-r}$$

$S =$ the sum of all infinite terms

$a_1 =$ the first term

$r =$ the common ratio

How did this formula → become this formula?

Sum of a finite geometric series.

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

→

Sum of an infinite geometric series, |r|<1

$$S = \frac{a_1}{1-r}$$

Since r is less than one and it is being raised to a very large power (∞) it becomes so small that it essentially become zero.
Therefore, $(1-r^n)$ becomes (1-0) and $a_1(1-0) = a_1(1) = a_1$

Find the sum of this infinite geometric series:

$$\frac{5}{6} + \frac{10}{18} + \frac{20}{54} + \frac{40}{162} + \ldots$$

infinite geometric

$r = \frac{2}{3}$

$$S = \frac{\frac{5}{6}}{1-\frac{2}{3}} = \frac{\frac{5}{6}}{\frac{1}{3}} = \frac{5}{6} \cdot \frac{3}{1} = \boxed{\frac{5}{2}}$$

Find the sum of this infinite geometric series:

7200 + -1440 + 288 + -57.6 + ...

$$r = \frac{-1440}{7200} = -.2$$

$$S = \frac{7200}{1 - -.2} = \boxed{6000}$$

Find the sum of each series, if it exists.

1. 29+26+23+20+...
2. 192+144+108+81+...
3. 84000 + -8400 + 840 + -84 + ...
4. 1.28+ 1.60+ 2+ 2.5+ ...
5. 29 + 32 + 35 + 38 + ... + 131

1. 29+26+23+20+...

infinite Arithmetic

No sum

2. 192+144+108+81+... infinite geometric

$$r = 3/4 = .75$$

$$S = \frac{192}{1-.75} = \frac{192}{.25} = \boxed{768}$$

3. 84000 + -8400 + 840 + -84 + ...

Infinite Geometric

$r = -.1$

$$S = \frac{84000}{1 - -.1} = \boxed{76363.\overline{63}}$$

4. 1.28+ 1.60+ 2+ 2.5+ ...

infinite Geometric $r = 1.25$

$\boxed{\text{No sum}}$

5. 29 + 32 + 35 + 38 + ... + 131

finite Arithmetic $d = 3$

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_n = \frac{n}{2}(29 + 131) \longrightarrow \text{find } n$$

$$131 = 29 + 3(n-1)$$

$$102 = 3(n-1)$$

$$34 = n - 1$$

$$35 = n$$

$$S_{35} = \frac{35}{2}(29 + 131)$$

$$= \boxed{2800}$$

You can now finish Hwk #34.

Practice Sheet: Geometric Series (Sec 11-5)

Due Monday