1.5 Infinite Series cont.

$200 + 20 + 2 + 0.2 + \ldots\ldots =$

$$S_\infty = \frac{t_1}{1-r}, \quad -1 < r < 1$$

$$= \frac{200}{1 - 1/10}$$

$$= 200 \div 9/10$$

$$= 200 \times \frac{10}{9}$$

$$= \frac{2000}{9} = 222.\overline{2}$$

ex) Add up this series $2+6+18+54, \ldots = \infty$

$$S_\infty = \frac{2}{1-3} = \frac{2}{-2} = -1$$

$-1 < r < 1$

$$S_n = \frac{t_1(1-r^n)}{1-r} \quad r^n \to 0$$

<u>convergent</u> series: the sum of ∞ terms approaches a finite value (limit)

<u>divergent</u> series: the sum of ∞ terms has no limit

For a geo. series to converge, $-1 < r < 1$.

ex) Find S_∞ for $2/3 + 2/15 + 2/75 + \dots$

✓Geometric? $r = 1/5$ $\quad -1 < r < 1$ ✓

$$S_\infty = \frac{2/3}{1 - 1/5}$$

$$= 2/3 \div 4/5$$

$$= 2/3 \times 5/4 = 5/6$$

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#1-5 (at least one of each)
#6-18
#22

#3 a) $0.\overline{87} = 0.\underbrace{87}\,\underbrace{87}\,\underbrace{87}\,\underbrace{87}\ldots$

$$0.87 + 0.0087 + 0.000087 + 0.00000087 + \ldots$$

$t_1 = 0.87 \qquad r = \frac{1}{100}$

$$S_\infty = \frac{0.87}{1 - \frac{1}{100}} = \frac{0.87}{\frac{99}{100}} \rightarrow \frac{87}{100} \div \frac{99}{100} = \frac{87}{\cancel{100}} \times \frac{\cancel{100}}{99} = \frac{87}{99}$$