11.3 Geometric Series

March 6

std. 22.0

sum of the 1st n terms of a geometric series:

$$S_n = a_1\left(\frac{1-r^n}{1-r}\right) \quad (r \neq 1)$$

proof:

ex. 1 **Using the "birthday money" sequence from yesterday, how much money Ryker receive, up through his 18th birthday?**

$1+2+4+\cdots+\underline{}_{a_{18}}$

$S=a_1\left(\frac{1-r^n}{1-r}\right)$

$S=1\left(\frac{1-2^{18}}{\cancel{1-2}_{-1}}\right)=2^{18}-1=\$262{,}143$

ex. 2 **Find the sum** $\sum_{n=1}^{8}-2\left(\frac{1}{5}\right)^{n-1}$

$a_1\cdot r^{n-1}$

$S_8=-2\left(\frac{1-.2^8}{1-.2}\right)$

$-2.5\approx-2\left(\frac{1-.2^8}{.8}\right)$

ex. 3

For the series $1 + 4 + 16 + \ldots$ find n so that $S_n = 87381$

$r = 4, \quad a_1 = 1$

$$S = a_1\left(\frac{1-r^n}{1-r}\right)$$

$$87381 = 1\left(\frac{1-4^n}{-3}\right)$$

$$-262{,}143 = 1-4^n$$

$$\log 4^{n} = \log 262{,}144$$

$$n = \frac{\log 262{,}144}{\log 4}$$