Series — Geometric and telescoping

Name: _____ Date: _____

Does each series converge? If it does, find its sum.

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

$$\frac{2}{n(n+2)} = \frac{1}{n} - \frac{1}{n+2}$$

$$S_n = 1 + \frac{1}{2} - \frac{1}{n+1} - \frac{1}{n+2}$$

$$S = \lim_{n\to\infty} S_n = 1 + \frac{1}{2} = \frac{3}{2}$$

2. $\sum_{n=1}^{\infty} \frac{3}{(n+3)(n+4)}$

3. $\sum_{n=1}^{\infty} -2(-2)^n$

4. $\sum_{n=1}^{\infty} -(-\frac{1}{2})^{n-1}$

5. $\sum_{n=0}^{\infty} 3(\frac{2}{3})^n$

6. $\sum_{n=1}^{\infty} 3(\frac{3}{2})^{n-1}$

Series · Geometric and telescoping — Answer key

1. $\infty\sum n = 1\frac{2}{n(n+2)}$ → converges, $S = \frac{3}{2}$

2. $\infty\sum n = 1\frac{3}{(n+3)(n+4)}$ → converges, $S = \frac{3}{4}$

3. $\infty\sum n = 1 - 2(-2)^n$ → diverges

4. $\infty\sum n = 1 - (-\frac{1}{2})^{n-1}$ → converges, $S = \frac{-2}{3}$

5. $\infty\sum n = 03(\frac{2}{3})^n$ → converges, $S = 9$

6. $\infty\sum n = 13(\frac{3}{2})^{n-1}$ → diverges