BLAKE FARMAN

Lafayette College

Name: $\underline{\text{Solutions}}$

1. Assuming that the pattern continues, compute the sum of the series
$$-3 + 2 - \frac{4}{3} + \frac{8}{9} - \frac{16}{27} + \ldots$$

The sequence of terms is given by $a_n = -3\left(\frac{-2}{3}\right)^{n-1}$:

$$a_1 = -3$$
$$a_2 = -3\left(\frac{-2}{3}\right) = 2$$
$$a_3 = -3\left(\frac{-2}{3}\right)^2 = \frac{-4}{3}$$
$$a_4 = -3\left(\frac{-2}{3}\right)^3 = \frac{-(-8)}{9} = \frac{8}{9}$$
$$a_5 = -3\left(\frac{-2}{3}\right)^4 = \frac{-16}{3^3} = \frac{-16}{27}$$

So this is a geometric series

$$\sum_{n=1}^{\infty} (-3)\left(\frac{-2}{3}\right)^{n-1} = -3 + 2 - \frac{4}{3} + \frac{8}{9} - \frac{16}{27} + \ldots$$

$$= \frac{-3}{1 - \left(\frac{-2}{3}\right)}$$

$$= \frac{-3}{\frac{5}{3}} = \boxed{\frac{-9}{5}}$$