((2)) ∞

Does the sequence $\left\{n\sin\left(\frac{3}{n}\right)\right\}^{\infty}$ converge or diverge? If it converges, find the limit.

lim
$$n \sin(\frac{3}{n}) = \lim_{n \to \infty} \frac{\sin(\frac{3}{n})}{\ln n + \infty} = \lim_{n \to \infty} \frac{\cos(\frac{3}{n})(\frac{3}{n^2})}{\ln n + \infty}$$

(form $\infty \cdot 0$) (form $\frac{3}{n}$) (Apply L'Hopital)

$$= \lim_{n \to \infty} 3 \cos(\frac{3}{n}) = 3 \cos(0) = 3.1 = \boxed{3}$$

2. Does the series $\sum_{k=0}^{\infty} \frac{2}{\pi^k}$ converge or diverge? If it converges, find the sum.

$$\sum_{\pi K}^{2} = 2 + \frac{2}{\pi} + \frac{2}{\pi^{2}} + \frac{2}{\pi^{3}} + \frac{2}{\pi^{4}} + \cdots$$

$$R = 0$$

$$1 \text{ geometric series, } a = 2, r = \frac{1}{\pi} < 1.$$

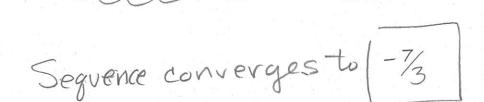
Converges
$$\sum_{\pi R}^{\infty} \frac{2}{\pi R} = \frac{2}{1-1}$$

$$\frac{2}{\pi - 1} = \frac{2\pi}{\pi - 1}$$

Does the sequence $\left\{\frac{4n+7e^n}{n-3e^n}\right\}_{n=1}^{\infty}$ converge or diverge? If it converges, find the limit.

$$\lim_{n\to\infty} \frac{4n+7e^n}{n-3e^n} = \lim_{n\to\infty} \frac{4+7e^n}{1-3e^n} = \lim_{n\to\infty} \frac{7e^n}{-3e^n} = \begin{bmatrix} -7\\ 3 \end{bmatrix}$$

$$\int_{\text{Litoptial}} \frac{4n+7e^n}{n-3e^n} = \lim_{n\to\infty} \frac{7e^n}{-3e^n} = \begin{bmatrix} -7\\ 3 \end{bmatrix}$$



Does the series $\sum_{k=0}^{\infty} \frac{5}{(-6)^k}$ converge or diverge? If it converges, find the *sum*.

$$\sum_{k=0}^{\infty} \frac{5}{(-6)^{k}} = 5 - \frac{5}{6} + \frac{5}{36} - \cdots$$

I geometric series, a = 5 $r = -\frac{1}{6}$, and |r| < 1. Therefore it converges.

$$\frac{2}{\sum_{k=0}^{5} (-6)^{k}} = \frac{5}{1-(-\frac{1}{6})} = \frac{5}{1+\frac{1}{6}} = \frac{5}{6} = \frac{30}{7}$$