

---

Complete the following problems. Show all work to receive full credit.

1. Determine if the following sequences converge or diverge:

(a)  $a_n = \frac{3^n \cdot 6^n}{2^{-n} \cdot n!}$

$$a_n = \frac{2^n \cdot 3^n \cdot 6^n}{n!} = \frac{36^n}{n!}$$

$$\lim_{n \rightarrow \infty} a_n = \lim_{n \rightarrow \infty} \frac{36^n}{n!} = 0$$

so the sequence converges.

(b)  $a_n = \frac{2^n - 1}{3^n}$

$$a_n = \frac{2^n}{3^n} - \frac{1}{3^n}$$

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

$$\lim_{n \rightarrow \infty} a_n = \lim_{n \rightarrow \infty} \left(\frac{2}{3}\right)^n - \frac{1}{3^n}$$

$$= \lim_{n \rightarrow \infty} \left(\frac{2}{3}\right)^n - \lim_{n \rightarrow \infty} \frac{1}{3^n}$$

$$= 0 - 0$$

$$= 0$$