

$$\sum_{k=1}^{\infty} \frac{k(k+12)}{(k+8)^2} \text{ diverges by the Test for Divergence}^\dagger \text{ since } \lim_{k \rightarrow \infty} a_k = \lim_{k \rightarrow \infty} \frac{k(k+12)}{(k+8)^2}$$
$$= \lim_{k \rightarrow \infty} \frac{1 \cdot (1 + 12/k)}{(1 + 8/k)^2} = 1 \neq 0.$$

†

Test for Divergence If $\lim_{n \rightarrow \infty} a_n$ does not exist or if $\lim_{n \rightarrow \infty} a_n \neq 0$, then the series $\sum_{n=1}^{\infty} a_n$ is divergent.