15. Does $\sum_{n=2}^{\infty} \frac{3}{n^2+1}$ converge? (Explain your answer.)

I compare this sum to $\sum \frac{1}{n^2}$ using the limit comparison test. $\sum \frac{1}{n^2}$ is the p-series with $p=2$. It converges since $p>1$.

$\lim_{n\to\infty} \frac{a_n}{b_n} = \lim_{n\to\infty} \frac{\frac{1}{n^2}}{\frac{3}{n^2+1}} = \lim_{n\to\infty} \frac{n^2+1}{3n^2} = \frac{1}{3}$ which is a finite, non-zero number.

$\therefore \sum_{n=1}^{\infty} \frac{3}{n^2+1}$ also converges.

16. Does $\sum_{n=2}^{\infty} \frac{n}{3^n}$ converge? (Explain your answer.)

I use the ratio test. Let $\rho = \lim_{n\to\infty} \left|\frac{a_{n+1}}{a_n}\right| = \lim_{n\to\infty} \frac{\frac{n+1}{3^{n+1}}}{\frac{n}{3^n}} = \lim_{n\to\infty} \frac{n+1}{n} \frac{3^n}{3^{n+1}}$

$= \lim_{n\to\infty} \frac{n+1}{n} \frac{1}{3} = \frac{1}{3} < 1$ The series converges.