11.1: 16 $a_n = \frac{(-1)^{n+1}}{n^2},\ n = 1,\ ,2, ...$

11.1: 32 $\lim_{n\to\infty} (-1)^n(1 - \frac{1}{n})$ does not exist $\Rightarrow$ diverges.

11.1: 50 $\lim_{n\to\infty} \left(1 - \frac{1}{n}\right)^n = \lim_{n\to\infty} \left[1 + \frac{(-1)}{n}\right]^n = e^{-1} \Rightarrow$ converges. (Theorem 5, #5)

11.1: 82 $\lim_{n\to\infty} \frac{1}{\sqrt{n^2-1} - \sqrt{n^2+n}} = \lim_{n\to\infty} (\frac{1}{\sqrt{n^2-1} - \sqrt{n^2+n}})(\frac{\sqrt{n^2-1} + \sqrt{n^2+n}}{\sqrt{n^2-1} - \sqrt{n^2+n}}) = \lim_{n\to\infty} \frac{\sqrt{n^2-1} + \sqrt{n^2+n}}{1-n} =$
$\lim_{n\to\infty} \frac{\sqrt{1 - \frac{1}{n^2}} + \sqrt{1 + \frac{1}{n}}}{-\frac{1}{n} - 1} = -2 \Rightarrow$ converges.

11.2: 6 $\frac{5}{n(n+1)} = \frac{5}{n} - \frac{5}{n+1} \Rightarrow S_n = (5 - \frac{5}{2}) + (\frac{5}{2} - \frac{5}{3}) + (\frac{5}{3} - \frac{5}{4}) + ... + (\frac{5}{n-1} - \frac{5}{n}) + (\frac{5}{n} - \frac{5}{n+1}) = 5 - \frac{5}{n+1} \Rightarrow \lim_{n\to\infty} S_n = 5$

11.2: 12 $(5 - 1) + (\frac{5}{2} - \frac{1}{3}) + (\frac{5}{4} - \frac{1}{9}) + (\frac{5}{8} - \frac{1}{27}) + ...$, is the difference of two geometric series; the sum is $\frac{5}{1-(\frac{1}{2})} - \frac{1}{1-(\frac{1}{3})} = 10 - \frac{3}{2} = \frac{17}{2}$

11.2: 14 $2 + \frac{4}{5} + \frac{8}{25} + \frac{16}{125} + ... = 2(1 + \frac{2}{5} + \frac{4}{25} + \frac{8}{125} + ...)$; the sum of this geometric series is $2\left(\frac{1}{1-(\frac{2}{5})}\right) = \frac{10}{3}$

11.2: 16 $\frac{6}{(2n-1)(2n+1)} = \frac{A}{2n-1} + \frac{B}{2n+1} = \frac{A(2n+1)+B(2n-1)}{(2n-1)(2n+1)} \Rightarrow A(2n+1) + B(2n-1) = 6 \Rightarrow (2A+2B)n + (A - B) = 6 \Rightarrow \begin{cases} 2A + 2B = 0 \\ A - B = 6 \end{cases} \Rightarrow \begin{cases} A + B = 0 \\ A - B = 6 \end{cases} \Rightarrow 2A = 6 \Rightarrow A = 3$ and $B = -3$. Hence,
$\sum_{n=1}^{k} \frac{6}{(2n-1)(2n+1)} = 3\sum_{n=1}^{k} \frac{1}{2n-1} + \frac{1}{2n+1} = 3\left(\frac{1}{1} - \frac{1}{3} + \frac{1}{3} - \frac{1}{5} + \frac{1}{5} - \frac{1}{7} + \ ...\ - \frac{1}{2(k-1)+1} + \frac{1}{2k-1} - \frac{1}{2k+1}\right) =$
$3(1 - \frac{1}{2k+1}) \Rightarrow$the sum is $\lim_{k\to\infty} 3(1 - \frac{1}{2k+1}) = 3$.

11.2: 30 $\lim_{n\to\infty} \ln\frac{1}{n} = -\infty \neq 0 \Rightarrow$ diverges.

11.2: 34 $\lim_{n\to\infty} \left(1 - \frac{1}{n}\right)^n = \lim_{n\to\infty} \left(1 + \frac{-1}{n}\right)^n = e^{-1} \neq 0 \Rightarrow$ diverges.

11.2: 48 $a = 1,\ r = \frac{3-x}{2}$; converges to $\frac{1}{1-(\frac{3-x}{2})} = \frac{2}{x-1}$ for $|\frac{3-x}{2} < 1$ or $1 < x < 5$.