

12.1: 35, 40, 42, 48, 66 ~~2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 41, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100~~

35. see bottom of page

40. $\frac{0}{1 + \sqrt{n}} \leq \frac{|\sin 2n|}{1 + \sqrt{n}} \leq \frac{1}{1 + \sqrt{n}}$

$\lim_{n \rightarrow \infty} \frac{1}{1 + \sqrt{n}} = 0 = \lim_{n \rightarrow \infty} \frac{0}{1 + \sqrt{n}}$

Thus, by the squeeze theorem

$\lim_{n \rightarrow \infty} \frac{\sin 2n}{1 + \sqrt{n}} = 0.$

42. $\lim_{n \rightarrow \infty} \frac{(\ln n)^2}{n} \approx \left(\frac{\infty}{\infty}\right)$

$\stackrel{L'H}{=} \lim_{n \rightarrow \infty} \frac{2 \ln n}{1} = \lim_{n \rightarrow \infty} 2 \frac{\ln n}{n} \left(\frac{\infty}{\infty}\right)$

$\stackrel{L'H}{=} \lim_{n \rightarrow \infty} \frac{2}{n} = 0.$

48. Just graph ~~the function~~

$f(x) = \sqrt{x} \sin(\pi/\sqrt{x})$ on $0 \leq x \leq 100$

to see that the limit is approximately π .

35. $a_n = \cos^2 n / 2^n$

$0 = \frac{0}{2^n} \leq a_n \leq \frac{1}{2^n}$

$\lim_{n \rightarrow \infty} 0 \leq \lim_{n \rightarrow \infty} a_n \leq \lim_{n \rightarrow \infty} \frac{1}{2^n} = 0$

$\Rightarrow \boxed{\lim_{n \rightarrow \infty} a_n = 0}$

66. $a_n = n + \frac{1}{n} \leq n + 1 \leq n + 1 + \frac{1}{n+1}$

$= a_{n+1}$

12.2: 6, 10, 12 - 20 even

6. you ~~graph~~ compute the partial sums to see that they converge to $\sum_{n=1}^{\infty} \left(\frac{6}{10}\right)^{n-1} = \frac{1}{1 - \frac{6}{10}} = \frac{4}{10} = \frac{2}{5}$.

10 a) they are the same

b) $\sum_{i=1}^n a_i = a_1 + a_2 + a_3 + \dots$

$\sum_{j=1}^n a_j = a_j + a_j + a_j + \dots = n a_j$

They are not the same

12. $\frac{1}{8} - \frac{1}{4} + \frac{1}{2} - 1 + \dots$

~~$\sum_{n=1}^{\infty} \left(\frac{1}{2}\right)^n = \frac{1/2}{1 - 1/2} = 1$~~

$= \frac{1}{8} (1 - 2 + 4 - 8 + \dots)$

$= \frac{1}{8} \sum_{n=1}^{\infty} (-2)^{n-1}$ **DIVERGENT**

14. $1 + \frac{4}{10} + \frac{16}{100} + \frac{64}{1000} + \dots$

$= \sum_{n=1}^{\infty} \left(\frac{4}{10}\right)^{n-1} = \frac{1}{1 - \frac{4}{10}} = \frac{10}{6} = \frac{5}{3}$

16. $\sum_{n=1}^{\infty} \frac{10^n}{(-9)^{n-1}} = \sum_{n=1}^{\infty} \frac{10^{n-1} \cdot 10}{(-1)^{n-1} 9^{n-1}}$

$= 10 \sum_{n=1}^{\infty} (-1)^{n-1} \left(\frac{10}{9}\right)^{n-1}$ **DIVERGENT**

18. $\sum_{n=0}^{\infty} \left(\frac{1}{\sqrt{2}}\right)^n = \sum_{n=1}^{\infty} \left(\frac{1}{\sqrt{2}}\right)^{n-1}$

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

20. $\sum_{n=1}^{\infty} \frac{e^n}{3^{n-1}} = e \sum_{n=1}^{\infty} \left(\frac{e}{3}\right)^{n-1}$

$= e \cdot \frac{1}{1 - \frac{e}{3}} = e \cdot \frac{1}{\frac{3-e}{3}} = \frac{3e}{3-e}$