AP Calculus BC – Unit 7 Extra Practice

7.1 – Extra Practice

Write the first 5 terms of the sequence:

#8a. $a_n = \sin\left(\frac{n\pi}{2}\right)$

#9b. $a_n = 2 + \frac{2}{n} - \frac{1}{n^2}$

#10b. Write the next two apparent terms of the sequence: $5, 10, 20, 40, \ldots$

#11b. Simplify: $\frac{(3n+2)!}{(3n-1)!}$

#12b. Find the limit (if possible) of the sequence: $a_n = \frac{2n}{\sqrt{n^2+1}}$

Determine the convergence or divergence of the sequence with the given nth term. If the sequence converges, find its limit:

#13b. $a_n = 8 + \frac{5}{n}$

#14b. $a_n = \frac{1+(-1)^n}{n^2}$

#15b. $a_n = \frac{(n-2)!}{n!}$

#16b. $a_n = \cos\left(\frac{\pi n}{n^2}\right)$

#17b. Determine whether the sequence is monotonic and whether it is bounded.

$a_n = \frac{3n}{n+2}$

#18b. Find an expression for the nth term:

$1,\ -\frac{1}{4},\ \frac{1}{9},\ -\frac{1}{16},\ \ldots$

7.2 – Extra Practice

Find the sequence of partial sums S_1, S_2, S_3, and S_4.

#11b. $\frac{1}{2\bullet 3}+\frac{2}{3\bullet 4}+\frac{3}{4\bullet 5}+\frac{4}{5\bullet 6}+\frac{5}{6\bullet 7}+\ldots$

#12b. $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{6}+\frac{1}{8}+\ldots$

Verify that the infinite series diverges:

#13b. $\sum_{n=0}^{\infty} 4(-1.05)^n$

#14b. $\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^2+1}}$

Verify that the infinite series converges:

#15b. $\sum_{n=0}^{\infty} 2\left(-\frac{1}{2}\right)^{n}$

#16b. $\sum_{n=1}^{\infty} \frac{1}{2^{n}}$

#17b. Find the sum of the convergent series

$$\sum_{n=2}^{\infty} 5\left(\frac{2}{3}\right)^{n}$$

#18b. Write the repeating decimal as a geometric
And write the sum of the series as a fraction:

$$0.\overline{49}$$

Determine if the series is convergent or divergent:

#19b. $\sum_{n=0}^{\infty}(1.075)^n$

#20b. $\sum_{n=1}^{\infty}\ln\left(\frac{1}{n}\right)$

#21b. $\sum_{n=1}^{\infty}\left(1+\frac{k}{n}\right)^n$

7.3 – Extra Practice

Confirm that the integral test applies, then use it to determine if the series converges or diverges.

#9b. $\sum_{n=1}^{\infty} \frac{2}{3n+5}$

#10b. $\sum_{n=1}^{\infty} ne^{-\frac{1}{2}n}$

Confirm that the integral test applies, then use it to determine if the series converges or diverges.

#11b. $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln(n)}}$

#12b. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+2}}$

Explain why the integral test does not apply to the series.

#13b. $\sum_{n=1}^{\infty} e^{-n} \cos(n)$

#14b. $\sum_{n=1}^{\infty} \left(\frac{\sin(n)}{n} \right)^2$

Use the p-series test to determine the convergence or divergence of the series.

#15b. $\sum_{n=1}^{\infty} \frac{1}{n^{1/2}}$

#16b. $\sum_{n=1}^{\infty} \frac{1}{n^5}$

#17b. $1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \frac{1}{4\sqrt{4}} + \ldots$

7.4 – Extra Practice

Use the Direct Comparison Test to determine the convergence or divergence of the series.

#10b. $\sum_{n=1}^{\infty} \frac{1}{3n^2 + 2}$

#11b. $\sum_{n=1}^{\infty} \frac{4^n}{5^n + 3}$

#12b. $\sum_{n=1}^{\infty} \frac{1}{n!}$

Use the Limit Comparison Test to determine the convergence or divergence of the series.

#13b. $\sum_{n=1}^{\infty} \frac{5}{4^n + 1}$

#14b. $\sum_{n=1}^{\infty} \frac{1}{n\sqrt{n^2 + 1}}$

#15b. $\sum_{n=1}^{\infty} \frac{n}{(n+1)2^{n-1}}$

7.5 – Extra Practice

Determine the convergence or divergence of the series.

#6b. $\displaystyle\sum_{n=1}^{\infty} \frac{n(-1)^{n+1}}{3n+2}$

#7b. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{1}{e^n}$

#8b. $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n}{\ln(n+1)}$

Determine the convergence or divergence of the series.

#9b. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{n}{n^2+5}$

#10b. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{n^2}{n^2+4}$

#11b. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{\ln(n+1)}{n+1}$

Determine the convergence or divergence of the series.

#12b. $\sum_{n=1}^{\infty} \frac{1}{n} \cos(n\pi)$

#13b. $\sum_{n=0}^{\infty} (-1)^n \frac{1}{(2n+1)!}$

#14b. $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\sqrt{n}}{\sqrt[3]{n}}$

Determine the convergence or divergence of the series.

#15b. $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$

#15c. $\sum_{n=1}^{\infty} \frac{6}{n(n+3)}$

7.6 – Extra Practice

Determine whether the series converges absolutely, conditionally, or diverges.

#4b. $\sum_{n=1}^{\infty}(-1)^n \frac{1}{n!}$

#5b. $\sum_{n=1}^{\infty}(-1)^n \frac{1}{\sqrt{n+4}}$

#6b. $\sum_{n=2}^{\infty}(-1)^{n}\frac{1}{n\ln(n)}$

#7b. $\sum_{n=1}^{\infty}(-1)^{n}\frac{1}{(2n+1)!}$

7.7 – Extra Practice

Simplify the expression fully.

#6b. $\dfrac{(n+1)4^n}{n4^{n+1}}$

#7b. $\dfrac{(2k-2)!}{(2k)!}$

Use the Ratio Test to determine the convergence or divergence of the series.

#8b. $\displaystyle\sum_{n=1}^{\infty}\frac{1}{n!}$

#9b. $\displaystyle\sum_{n=1}^{\infty}\frac{6^n}{n!}$

#10b. $\displaystyle\sum_{n=1}^{\infty}\frac{n}{4^n}$

#11b. $\displaystyle\sum_{n=0}^{\infty}\frac{(n!)^2}{(3n)!}$

Use the Ratio Test to determine the convergence or divergence of the series.

#12b. $\sum_{n=1}^{\infty} \frac{(-1)^n 3^n}{n2^n}$

#13b. $\sum_{n=0}^{\infty} \frac{6^n}{(n+1)^n}$

Use the Root Test to determine the convergence or divergence of the series.

#14b. $\sum_{n=1}^{\infty}\left(\frac{2n}{n+1}\right)^n$

#15b. $\sum_{n=1}^{\infty}\left(-\frac{3n}{2n+1}\right)^n$

#16b. $\sum_{n=1}^{\infty}\frac{n}{3^n}$

#17b. $\sum_{n=1}^{\infty}\left(\frac{n}{500}\right)^n$

7.8 – Extra Practice

Approximate the sum of the series using the first 6 terms.

#4b. $\sum_{n=1}^{\infty} \frac{4(-1)^{n+1}}{\ln(n+1)}$

#5b. $\sum_{n=1}^{\infty} \frac{n(-1)^{n+1}}{3^n}$

How many terms are required to approximate the series with an error of less than 0.001?

#6b. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n^3 - 1}$