

Moodle Exercise Set 1

Calculus and Linear Algebra II

Spring 2020

1. What is the value of $\binom{5}{3}$?
A. 10 B. 20 C. 120 D. $5/3$
2. What is the value of $\binom{6}{4}$?
A. 24 B. 15 C. 720 D. $3/2$
3. What is the coefficient of x^6 in the expansion of $(1+x)^{10}$?
A. 10 B. $\binom{6}{10}$ C. $\binom{10}{4}$ D. $\binom{10}{5}$
4. What is the coefficient of a^6b^2 in the expansion of $(a+b)^8$?
A. 1 B. $\binom{8}{6}$ C. $\binom{6}{2}$ D. $\binom{8}{6}\binom{8}{2}$
5. What is the coefficient of α^3 in the expansion of $(\alpha^{\frac{3}{2}} - 1)^{15}$?
A. $-\binom{15}{13}$ B. $\binom{15}{2}$ C. $\binom{15}{\frac{3}{2}}$ D. $-\binom{15}{3}$
6. What is the coefficient of $\alpha^4\beta^5$ in the expansion of $(\alpha^2 - \beta)^7$?
A. $\binom{7}{5}$ B. $-\binom{7}{2}$ C. $\binom{7}{4}$ D. $\binom{5}{4}$
7. Which of the following equals $\binom{15}{7}$?
A. $\binom{10}{7} + \binom{5}{7}$ B. $\binom{15}{6}$ C. $\binom{14}{7} + \binom{14}{6}$ D. The coefficient of x^7 in $(1-x)^{15}$
8. Which of the following equals $\binom{23}{15}$?
A. $\binom{22}{15} + \binom{22}{12}$ B. $\binom{23}{7}$ C. $\binom{22}{15} + \binom{22}{7}$ D. $\binom{22}{7} + \binom{22}{8}$
9. Determine whether the series $1+0.4+0.16+0.064+\dots$ is convergent or divergent. If it is convergent, what is the sum?
A. the series converges to $5/3$.
B. the series converges to $5/2$.
C. the series converges to 1.63
D. The series is divergent.
10. Determine whether the series $3+2+\frac{4}{3}+\frac{8}{9}+\dots$ is convergent or divergent. If it is convergent, what is the sum?
A. the series converges to 9
B. the series converges to $15/2$
C. the series converges to 7.22
D. The series is divergent
11. Determine whether the series $3-4+\frac{16}{3}-\frac{64}{9}+\dots$ is convergent or divergent. If it is convergent, what is the sum?
A. the series converges to -2.77
B. the series converges to $9/7$
C. the series converges to $-9/4$

- D. The series is divergent
12. Determine whether the series $\sum_{k=1}^{\infty} \frac{10^n}{(-9)^{n-1}}$ is convergent or divergent. If it is convergent, what is the sum?
- A. The series converges to -90 .
 B. The series converges to 11.23 .
 C. The series converges to $-100/9$.
 D. The series is divergent.
13. Determine whether the series $\sum_{k=1}^{\infty} \frac{(-3)^{k-1}}{4^k}$ is convergent or divergent. If it is convergent, what is the sum?
- A. The sum converges to $-1/3$.
 B. The sum converges to $4/7$.
 C. The sum converges to $1/7$.
 D. The series is divergent.
14. Determine whether the series $\sum_{n=0}^{\infty} \frac{\pi^n}{3^{n+1}}$ is convergent or divergent. If it is convergent, what is the sum?
- A. The series converges to $\frac{1}{3-\pi}$
 B. The series converges to $\frac{3}{3-\pi}$
 C. The series converges to $\frac{1}{\pi}$
 D. The series is divergent.
15. Any real number with infinitely many non-zero digits after the decimal point can be written as a geometric sum. For instance,

$$0.\bar{3} = 0.3333\dots = \sum_{k=1}^{\infty} 3 \cdot \left(\frac{1}{10}\right)^k.$$

What is $0.\bar{2} = 0.222\dots$ as a ratio of integers?

- A. $20/9$ B. $11/50$ C. $1/5$ D. $2/9$
16. Any real number with infinitely many non-zero digits after the decimal point can be written as a geometric sum. For instance,

$$0.\bar{3} = 0.3333\dots = \sum_{k=1}^{\infty} 3 \cdot \left(\frac{1}{10}\right)^k.$$

What is $0.\overline{73} = 0.737373\dots$ as a ratio of integers?

- A. $73/99$ B. $73/100$ C. $722/333$ D. $25/33$
17. What is the radius of convergence ρ of the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} x^n}{n^3}$? For what values of x does the series converge?
- A. $\rho = 1$ and the series converges for $x \in (-1, 1)$.
 B. $\rho = 1/2$ and the series converges for $x \in (-1/2, 1/2)$.
 C. $\rho = 1$ and the series converges for $x \in [-1, 1]$.
 D. $\rho = 0$ and the series converges for $x = 0$.
18. What is the radius of convergence ρ of the series $\sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n}}$? For what values of x does the series converge?
- A. $\rho = 1$ and the series converges for $x \in (-1, 1)$.
 B. $\rho = 1$ and the series converges for $x \in [-1, 1)$.

- C. $\rho = 1$ and the series converges for $x \in [-1, 1]$.
D. $\rho = 1$ and the series converges for $x \in (-1, 1]$.
19. What is the radius of convergence ρ of the series $\sum_{n=1}^{\infty} \frac{(x-2)^n}{n^2+1}$? For what values of x does the series converge?
- A. $\rho = 1$ and the series converges for $(-1, 1)$.
B. $\rho = 2$ and the series converges for $[-3, -1] \cup [1, 3]$.
C. $\rho = 1$ and the series converges for $[1, 3]$.
D. $\rho = 3$ and the series converges for $(-3, 3)$.
20. What is the radius of convergence ρ of the series $\sum_{k=1}^{\infty} k!(2x - 1)^k$? For what values of x does the series converge?
- A. $\rho = 0$ and the series does not converge for any x .
B. $\rho = 0$ and the series converges for $x = 1/2$.
C. $\rho = \infty$ and the series converges for all x .
D. $\rho = 0$ and the series converges for $x = 0$.