The matrices X and Y are defined as follows.

$$X = \begin{bmatrix} 1 & 0 \\ -1 & 2 \\ 3 & -1 \end{bmatrix} \; and \; \mathrm{Y} = \begin{bmatrix} -1 & 0 \\ 5 & -3 \\ 2 & 5 \end{bmatrix}$$

1. Which one of the following is correctly representing X - Y?

A. $\begin{bmatrix} -1 & -3 \\ 6 & -0 \\ 1 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 2 & 0 \\ -6 & 5 \\ 1 & -6 \end{bmatrix}$

C. $\begin{bmatrix} 6 & 2 \\ -1 & 1 \\ 0 & -2 \end{bmatrix}$

D. $\begin{bmatrix} -1 & -6 \\ 4 & 0 \\ -3 & 1 \end{bmatrix}$

E. None of the mentioned answers.

2. Which one of the following is correctly representing $X.Y^T$?

A. $\begin{bmatrix} 9 & -6 \\ 0 & -1 \\ -3 & 12 \end{bmatrix}$

B. $\begin{bmatrix} -1 & 5 & 2 \\ 1 & -11 & 8 \\ -3 & 18 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 9 & -1 & -4 \\ -8 & -2 & 12 \end{bmatrix}$

D. $\begin{bmatrix} -4 & 9 & -2 \\ 6 & -9 & -6 \\ -11 & 18 & 8 \end{bmatrix}$

E. None of the mentioned answers.

The matrices X and Y are defined as follows.

$$X = \begin{bmatrix} -1 & 1 \\ 0 & 2 \\ -2 & -1 \end{bmatrix} \; and \; \mathrm{Y} = \begin{bmatrix} 0 & 3 \\ -2 & -1 \\ 1 & -5 \end{bmatrix}$$

3. Which one of the following is correctly representing X - Y?

F. $\begin{bmatrix} -1 & -3 \\ 6 & -0 \\ 1 & 2 \end{bmatrix}$

G. $\begin{bmatrix} 2 & 0 \\ -6 & 5 \\ 1 & -6 \end{bmatrix}$

H. $\begin{bmatrix} 6 & 2 \\ -1 & 1 \\ 0 & -2 \end{bmatrix}$

I. $\begin{bmatrix} -1 & -2 \\ 2 & 3 \\ -3 & 4 \end{bmatrix}$

J. None of the mentioned answers.

4. Which one of the following is correctly representing $X.Y^T$?

A. $\begin{bmatrix} 9 & -6 \\ 0 & -1 \\ -3 & 12 \end{bmatrix}$

B. $\begin{bmatrix} 3 & 1 & -6 \\ 6 & -2 & -10 \\ -3 & 5 & 3 \end{bmatrix}$

C. $\begin{bmatrix} 9 & -1 & -4 \\ -8 & -2 & 12 \end{bmatrix}$

D. $\begin{bmatrix} -4 & 9 & -2 \\ 6 & -9 & -6 \\ -11 & 18 & 8 \end{bmatrix}$

E. None of the mentioned answers.

5. Matrix representation of two linear transformations T_1 and T_2 are given by T_1 and T_2 matrices below.

$T_1 = \begin{bmatrix} -1 & 0 \\ -1 & 1 \end{bmatrix}, T_2 = \begin{bmatrix} 0 & 1 \\ -2 & 3 \end{bmatrix}$

The composite transformation of first do T_2 then do T_1 is given by,

A. $\begin{bmatrix} -1 & 3 \\ 0 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 0 & -2 \\ 1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -1 \\ -2 & 2 \end{bmatrix}$

D. $\begin{bmatrix} -2 & -2 \\ -3 & 0 \end{bmatrix}$

E. None of the mentioned answers.

6. Matrix representation of two linear transformations T_1 and T_2 are given by T_1 and T_2 matrices below.

$T_1 = \begin{bmatrix} 1 & 2 \\ -1 & 0 \end{bmatrix}, T_2 = \begin{bmatrix} -1 & 1 \\ 0 & 3 \end{bmatrix}$

The composite transformation of first do T_1 then do T_2 is given by,

A. $\begin{bmatrix} -1 & 3 \\ 0 & 2 \end{bmatrix}$

B. $\begin{bmatrix} 0 & -2 \\ 1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 2 & 0 \\ 3 & -1 \end{bmatrix}$

D. $\begin{bmatrix} -2 & -2 \\ -3 & 0 \end{bmatrix}$

E. None of the mentioned answers.

7. U = {x: $1 \leq x \leq 10$, where x is an integer}, A = {2,4,6,8,10} and B= {3,4,5,6,10}

Which one of the following is correct?

A. $A \subset B$
B. $B' \subset A$
C. $A \cap B = \{\}$
D. $A' \setminus B' = B \setminus A$
E. None of the mentioned answers.

8. U = {x: $1 \leq x \leq 10$, where x is an integer},
A = Set of all odd numbers between 1 and 10 (both inclusive)
B = Set of all multiples of 3 between 1 and 10 (both inclusive)

Which one of the following is correct?
A. $A' \setminus (A \cup B)' = \{6\}$
B. $A' \setminus (A \cup B)' = \{2,4,8,10\}$
C. $A \cap B = \{\}$
D. $A \subset B$
E. None of the mentioned answers.

9. Given $f(x) = \ln(x^2 + 1)$ and $g(x) = \sin(3x)$, what is $(f \circ g)(x)$?
A. $\ln(sin^2\ 3x + 1)$
B. $\ln(x^2 + 1)\ .\sin(3x)$
C. $\sin 3(\ln(x^2 + 1))$
D. $\ln(3x.(x^2 + 1))$
E. None of the mentioned answers.

10. Given $f(x) = \cos(2x^2 - 1)$ and $g(x) = \ln\left(\frac{x}{2}\right)$, what is $(f \circ g)(x)$?
A. $\ln\left(cos\ (2x^2 - 1).\left(\frac{x}{2}\right)\right)$
B. $\ln\left(\frac{x}{2}\right).\cos(2x^2 - 1)$
C. $\cos\left(2\left(\ln\frac{x}{2}\right)^2 - 1\right)$
D. $\ln\left(\frac{x}{2}(2x^2 - 1)\right)$
E. None of the mentioned answers.

11. What is the inverse function of $f(x) = (2x + 1)^3$?
A. $(2x + 1)^{-3}$
B. $(2x + 1)^{\frac{1}{3}}$
C. $\frac{x^{\frac{1}{3}} - 1}{2}$
D. $x^{\frac{1}{3}} - 1$
E. None of the mentioned answers.

12. What is the inverse function of $f(x) = (5x - 1)^5$?

F. $(2x+1)^{-5}$

G. $(2x+1)^{\frac{1}{5}}$

H. $\frac{x^{\frac{1}{5}}+1}{5}$

I. $x^{\frac{1}{5}}-1$

J. None of the mentioned answers.

13. Which one of the following is equal to the value of s(t) = 4 ln(3t). sin (3θ) when t = 2 and θ = π/9 radians?

A. $2\ln 6$

B. $4\sqrt{3}.\ln 6$

C. $2\sqrt{3}.\ln 6$

D. $\sqrt{3}.\ln 6$

E. None of the mentioned answers.

14. Which one of the following is equal to the value of *s(t)* = (- *ln(3t)* + *cos (2θ)*) when *t = 1* and *θ = π/4* radians?

A. $-ln\,3$

B. $1-ln\,3$

C. 0

D. -1

E. None of the mentioned answers.

15. Given that *U(n)= ln(2kn) + 3* where k is a number, which one of the following is the value of *n* if *U(n) = 0*?

A. 0

B. $\frac{1}{2k.e^3}$

C. $\frac{3}{2k}$

D. $\frac{ln\,3}{2k}$

E. None of the mentioned answers.

16. Given that U(n)= ln(kn) + 10 where k is a number, which one of the following is the value of n if U(n) = 10?

A. $\frac{1}{k}$
B. $\frac{e^{10}}{k}$
C. $\frac{10}{k}$
D. $\frac{ln(10)}{k}$
E. None of the mentioned answers.

17. Find the value of x in the following equation.

$\left(\frac{1}{3}\right)^{2x-1} = \frac{1}{243}$

A. $\frac{2}{5}$
B. $\frac{1}{5}$
C. 3
D. -3
E. None of the mentioned answers.

18. Find the value of x in the following equation.

$\left(\frac{1}{5}\right)^{3x-6} = 125$

A. $\frac{2}{5}$
B. $\frac{1}{5}$
C. -1
D. 1
E. None of the mentioned answers.

In a city, it is estimated that 3% of the population suffer from a certain disease. When the diagnostic test (for that particular disease) is applied to a **sufferer**, test gives the correct result of 97%. When the same test is applied to a **non-sufferer**, test gives the correct result of 96%.

Suppose that the test is now administered to a person about whom we have no relevant information relating to the disease (apart from the fact that he/she comes from this population). Calculate the following probabilities:

19. What is the probability that the administered person is a non-sufferer?

A. 0.0300
B. 0.3000
C. 0.9600
D. 0.0400
E. None of the above.

20. What is the probability that the test result will be positive?

A. 0.9700

B. 0.9600

C. 0.6790

D. 0.0679

E. None of the mentioned answers.

21. What is the probability that, given a positive test result, the person is a sufferer?

A. 0.0300

B. 0.0960

C. 0.2857

D. 0.4286

E. None of the mentioned answers.

22. If the displacement, *s(x)*, of a body at time t is given by $s(x) = -2x^3 - x^2 + 3x$, which one of the following is the acceleration, *a(x)*, of the body at time *x*?

A. $12x + 2$

B. $-12x - 2$

C. $-6x^2 - 2x + 3$

D. $6x + 1$

E. None of the mentioned answers.

23. If the displacement, s(t), of a body at time t is given by $s(t) = -t^4 + 2t^2 - 6t$, which one of the following is the acceleration, a(t), of the body at time t?

A. $12t + 2$

B. $-12t^2 + 4$

C. $-4t^3 + 4t - 6$

D. $6t + 1$

E. None of the mentioned answers.

24. If $y = \cos(\ln(2x^3 - 1)), then \frac{dy}{dx} is,$

A. $\frac{6x^2.\sin(x^2+1)}{2x^3-1}$

B. $-\left(\frac{6x^2}{2x^3-1}\right) sin\,(\ln(2x^3-1)$

C. $\frac{\cos 2x}{x^2+1}$

D. $sin(2x)$

E. None of the mentioned answers.

25. If $y = \sin(\ln(x^2+1)), then \frac{dy}{dx} is,$

A. $\frac{2x.\ln(x^2+1)}{x^2+1}$

B. $\cos(\ln(x^2+1))$

C. $\frac{\cos 2x}{x^2+1}$

D. $sin(2x)$

E. None of the mentioned answers.

26. The *x* coordinates of the turning points of the function $y = \frac{6x^3}{9} - x^2 - 4x + 8$ are,

A. -1, 2

B. 1, 2

C. 1, 4

D. No turning points.

E. None of the mentioned answers.

27. The x coordinates of the turning points of the function $y = \frac{2x^3}{3} + x^2 - 12x + 10$are,

A. 1

B. -3, 4

C. 2, -3

D. No turning points.

E. None of the mentioned answers.

28. Determine $\int \left(\frac{1}{t^2} - t^{5/3} - 2\right) dt$.

A. $-\frac{3}{t^4} + \frac{5}{3}t^{2/3} + c$

B. $-\frac{1}{t} - \frac{3t^{8/3}}{8} - 2t + c$

C. $t^{-2} - 5t^3 - t + c$

D. $20t^4 + 18t^2 + c$

E. None of the mentioned answers.

29. Determine $\int \left(\frac{2}{t^3} + 12t^{3/2} - 5\right) dt$.

A. $-\frac{6}{t^4} + 18t^{1/2} + c$

B. $-\frac{1}{t^2} + \frac{24t^{5/2}}{5} - 5t + c$

C. $t^3 + 3t^4 - t + c$
D. $20t^4 + 18t^2 + c$
E. None of the mentioned answers.

30. The value of $\int_{-2}^{2}(-t^2 + 2t^3 - 3t)\,dt$ is,

A. 0

B. $\frac{20}{3}$

C. $-\frac{16}{3}$

D. $-\frac{40}{3}$

E. None of the above.

31. The value of $\int_{-1}^{2}(4t^3 - 3t^2 - t)\,dt$ is,

A. 2.5

B. -3

C. 1

D. 4.5

E. None of the above.

The table below shows the duration of calls at an office and the number of calls within each given duration.

Duration (in minutes)	Frequency (f) (number of calls)
0 - 5	6
5 - 10	8
10 – 15	12
15 – 20	4
20 – 25	3
25 - 30	2

32. The mean of the distribution is,
A. 12.9
B. 12.5
C. 11.6
D. 15
E. None of the above.

33. The mode of the distribution is,

A. 11.67
B. 12.5
C. 10
D. 15
E. None of the above.

34. The standard deviation of the distribution is,
A. 11.9286
B. 46.8163
C. 2.0469
D. 6.8422
E. None of the above.

The table below shows the number of students present in a class over a 20-day period.

Number of students	Number of days
10 - 12	2
12 – 14	4
14 – 16	8
16 – 18	5
18 – 20	1

35. The mean of the distribution is,
A. 14.9
B. 13.5
C. 12.7
D. 14
E. None of the above.

36. The mode of the distribution is,
A. 13.1325
B. 15.1429
C. 15
D. 14
E. None of the above.

37. The standard deviation of the distribution is,
A. 4.19
B. 1.2345
C. 2.0469
D. 3.125
E. None of the above.