

TMUA Mock Paper 1

20 questions. Recreated from the publicly available paper.

Question 1

The first three terms of a geometric sequence are $\sqrt{2}$, 2, $2\sqrt{2}$. What is the seventh term?

A.8

B. $8\sqrt{2}$

C.16

D. $16\sqrt{2}$

E.32

Question 2

Evaluate $\int_1^4 \frac{3x-2}{\sqrt{x}} dx$.

- A.6
- B.8
- C.10
- D.12
- E.14

Question 3

The line $y = 2x + c$ does not intersect the curve $y = x^2 - 4x + 7$. Find the set of values of c .

A. $c > -2$

B. $c < 2$

C. $c > 2$

D. $c < -2$

E. $-2 < c < 2$

Question 4

Find the sum of all real solutions of $x - 5\sqrt{x} + 6 = 0$.

- A.5
- B.13
- C.6
- D.25
- E.90

Question 5

Find $\sum_{n=0}^{\infty} \frac{\cos(n\pi)}{3^n}$.

A. $\frac{3}{2}$

B. $\frac{2}{3}$

C. $\frac{3}{4}$

D. $\frac{1}{2}$

E. $\frac{9}{4}$

Question 6

The circle C has equation $x^2 + y^2 - 6x + 8y + 21 = 0$. Find the length of the tangent to C drawn from the origin.

A. $\sqrt{13}$

B. $\sqrt{5}$

C. 21

D. $\sqrt{29}$

E. $\sqrt{21}$

Question 7

Evaluate $\prod_{n=2}^{99} \left(1 - \frac{1}{n^2}\right)$.

A. $\frac{50}{99}$

B. $\frac{1}{99}$

C. $\frac{100}{99}$

D. $\frac{1}{2}$

E. $\frac{25}{99}$

Question 8

Find the area of the region enclosed between the graphs of $y = |x - 1|$ and $y = 3 - |x - 1|$.

A.9

B.2.25

C.4.5

D.3

E.6

Question 9

Find the maximum value of $f(x, y) = -2x^2 - y^2 + 8x + 6y - 5$.

- A.8
- B.12
- C.9
- D.3
- E.20

Question 10

Find the coefficient of x^5 in the expansion of $(1+x)^3(1+2x)^4$.

A.168

B.144

C.96

D.208

E.120

Question 11

For how many integer values of k does the equation $x^3 - 3x^2 = k$ have three distinct real solutions?

A.4

B.5

C.2

D.3

E.6

Question 12

A quadratic curve has a minimum point at $(2, -3)$ and passes through $(0, 5)$. What is the coefficient of x^2 ?

A. 2

B. $\frac{1}{2}$

C. 4

D. 8

E. -2

Question 13

Given that $\log_a b = 3$ and $\log_b c = 4$, find $\log_a c$.

A.7

B. $\frac{4}{3}$

C.12

D.64

E.81

Question 14

How many solutions does $2\sin^2 x = \sin x + 1$ have in the interval $0 \leq x < 2\pi$?

A.4

B.2

C.5

D.3

E.1

Question 15

Let $F(n) = \int_0^n (2x - 1) dx$ for positive integers n . What is the largest n for which $F(n) < 90$?

- A.9
- B.10
- C.8
- D.11
- E.45

Question 16

How many real solutions does $9^x - 10 \cdot 3^x + 9 = 0$ have?

A.1

B.0

C.2

D.3

E.4

Question 17

The parabola $y = x^2$ is rotated 180° about the origin and then translated by the vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$. What is the equation of the resulting curve?

A. $y = -x^2 + 4x - 4$

B. $y = -x^2 - 4x - 4$

C. $y = x^2 - 4x + 4$

D. $y = -x^2 + 4x + 4$

E. $y = -(x + 2)^2$

Question 18

Evaluate $\cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \cdots + \cos^2 89^\circ$.

A.45

B.44.5

C.44

D.89

E.88.5

Question 19

The region between the curves $y = x$ and $y = x^3$ for $0 \leq x \leq 1$ is divided by the vertical line $x = a$ into two parts of equal area. Which equation does a satisfy?

A. $2a^4 - 4a^2 + 1 = 0$

B. $2a^4 - 4a^2 - 1 = 0$

C. $a^4 - 2a^2 + 1 = 0$

D. $2a^4 - 4a^2 + 2 = 0$

E. $4a^4 - 2a^2 + 1 = 0$

Question 20

The line L is a tangent to the curve $y = x^4 - 4x^3 + 8x$ at two distinct points. Find the y -intercept of L .

A.4

B.8

C.-4

D.-8

E.-2

Answer key

1. Answer: B
2. Answer: C
3. Answer: D
4. Answer: B
5. Answer: C
6. Answer: E
7. Answer: A
8. Answer: C
9. Answer: B
10. Answer: A
11. Answer: D
12. Answer: A
13. Answer: C
14. Answer: D
15. Answer: A
16. Answer: C
17. Answer: A
18. Answer: B
19. Answer: A
20. Answer: C

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