



OxbridgeMind TMUA Paper 1

Recommended time: 75 minutes

Calculators: not permitted

Format: 15 multiple-choice questions

This community paper is presented in a clean, print-ready format. The wording, mathematics, answer choices, and diagrams are preserved from the source paper.

Paper guidance

- Attempt every question. Select the best answer from the choices given.
- If a diagram is shown, it is reproduced from the source material and may not be drawn to scale.
- This question paper does not include worked solutions or a marked answer key.

Best of luck, and enjoy the challenge!

Source credit: OxbridgeMind

Question 1

Given that $\frac{a^x b^{3x}}{c^{2x}} = 5$ where a , b and c are positive real number then $x =$

A $\frac{1}{a+3b-2c}$

B $\frac{1}{a+3b+2c}$

C $\frac{2c}{a+3b}$

D $a + 3b + 2c$

E $(a \times 3b)^{2c}$

Question 2

It is known that $x + 3$ is a factor of $f(x) = x^3 + 2kx^2 + (k + 1)^2x + 21$. The sum of the possible values of k is

- A 2
- B 3
- C 4
- D 5
- E 6

Question 3

The complete set of values of x for which $(x^4 - 1)(x + 3) > 0$ are:

A $0 < x < 1, -3 < x < -1$

B $-3 < x < -1, x > 1$

C $x < -3, -1 < x < 1$

D $-3 < x < 1$

E $x > 1, x < -3$

Question 4

The perpendicular bisector of the line segment joining the point $(-2, 15)$ and $(4, 1)$ cuts the y -axis at the y -coordinate

A $-\frac{51}{7}$

B $-\frac{53}{3}$

C 8

D $\frac{59}{7}$

E $\frac{53}{7}$

Question 5

Find the number of real solutions in the interval $0 < \theta < \frac{5\pi}{2}$ of the equation $\cos^2 \theta + 7 \sin \theta = 7$

A 0

B 1

C 2

D 3

E 4

Question 6

Consider the simultaneous equations:

$$3x^2 + 15y = 6$$

$$2x + 5y = 3$$

the sum $x + y$ therefore equals

A $\frac{6}{5}$

B $\frac{4}{5}$

C $-\frac{4}{5}$

D 0

E Equations are not consistent

Question 7

Five students took a math's test and got scores A, B, C, D, E with $E > D, C > B, B > D$ and $A > D$.

How many ways could the candidates be ranked?

A 12

B 9

C 16

D 8

E 20

Question 8

Let $F_k = F_{k-1} + F_{k-2}$ where $F_0 = 0$, $F_1 = 1$. Define the series $s(x) = \sum_{k=1}^{\infty} \frac{F_k}{x^k}$ for $x > 2$. What is the value of $s(x)$

A $\frac{x^2}{x^2-x-1}$

B $\frac{x}{x^2-x-1}$

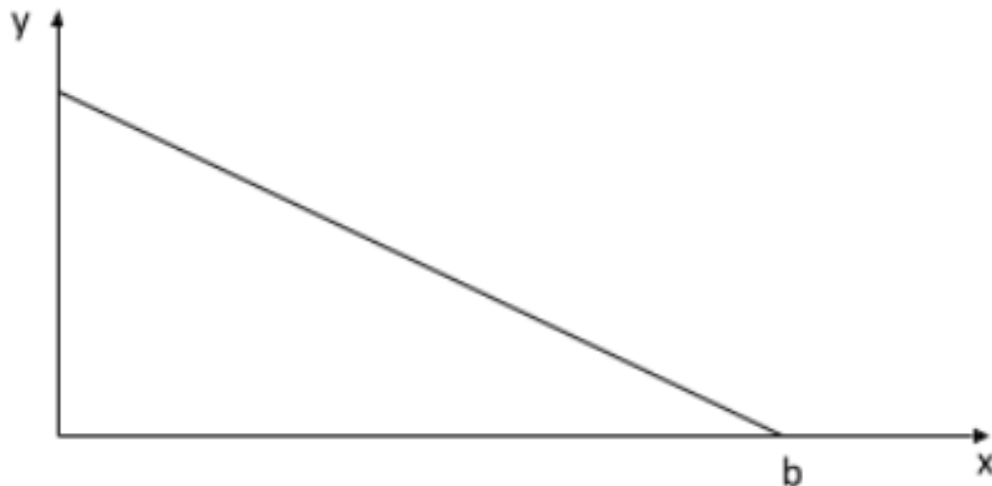
C $\frac{1}{x^2-x-1}$

D $x - 1$

E $\frac{x^2-1}{x}$

Question 9

A line crosses the x and y -axis at $(b, 0)$ and $(0, 1)$ where $b > 0$. Squares are placed successively inside the right angled triangle to form the figure given below. What is the area enclosed by all squares, when the number goes to infinity?



- A $\frac{1}{3}b^2$
- B $\frac{b^2}{b+1}$
- C $\frac{b}{2b+1}$
- D $\frac{b^2}{2b+1}$
- E $2b$

Question 10

A runner leaves their home and reaches their destination after an hour. The velocity of the runner varies according to the function $v(t) = \cos\left(\frac{t\pi}{2}\right)$ where t is the time in hours. Find the time where the runner reaches halfway in distance

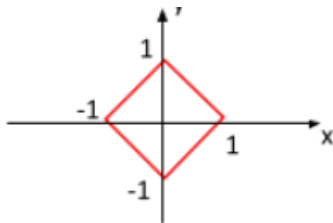
- A** 10 minutes
- B** 15 minutes
- C** 20 minutes
- D** 30 minutes
- E** 40 minutes

Question 11

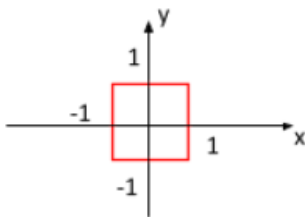
Which sketch represents

$$|x|^3 + |y|^3 = 1?$$

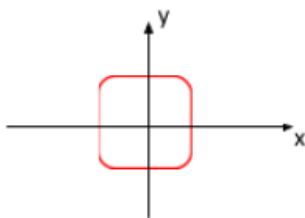
A A



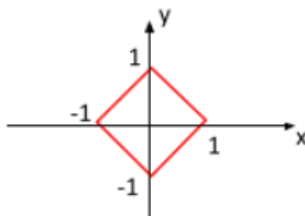
B B



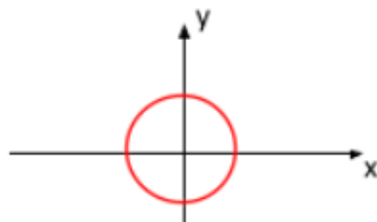
C C



D D



E E



Question 12

What is the largest integer n such that $n + 3$ perfectly divides $n^2 + 27$?

- A 33
- B 15
- C 6
- D 3
- E 60

Question 13

For $k > 0$, the function

$$f(x) = \left(k + \frac{5}{2}\right)x^2 + 3k^2x + 6k$$

has its minimum at $x = -1$. Find k .

- A** $\frac{2}{3}$
- B** -1
- C** $\frac{5}{3}$
- D** 3
- E** 1

Question 14

a , b , c and d are positive integers such that

$$a + \frac{1}{b + \frac{1}{c + \frac{1}{d}}} = \frac{15}{11}$$

Which one of the four integer is largest

- A** a
- B** b
- C** c
- D** d
- E** all are same

Question 15

The real roots of the equation

$$4^{2x} + 3 = 2^{2x+2}$$

are p and q where $p > q$. The value of $p - q$ can be expressed as:

- A** 3
- B** 2
- C** $\frac{1}{2} \log_2 2$
- D** $\frac{1}{2} \log_2 3$
- E** 0