HIGHER LEVEL - 2022

Closed questions

Question 1H *(2 p.)* The graph of $f(x) = x^2 + px + r$ has a minimum value when $x = -1$. The distance between the two zeros of f is 6. Then:

A. $p = 1,\ r = -2$ **B.** $p = 2,\ r = -8$ **C.** $p = -1,\ r = 2$ **D.** $p = 2,\ r = 3$

Question 2H *(2 p.)*

In an aritmetic sequence $a_1, a_2, \ldots, a_n, a_{n+1}, \ldots$ we have:

$$a_1 = 2,\ a_n = 5 \text{ and } S_n = a_1 + a_2 +, \ldots + a_n = 24,5.$$

Then the sum $S_{2n} = a_1 + a_2 +, \ldots + a_{2n}$ is equal to:

A. 63 **B.** $66,5$ **C.** $73,5$ **D.** 80

Question 3H *(2 p.)*

If $\operatorname{ctg}\alpha = 3$, then $\cos 2\alpha$ is equal to:

A. $\frac{4}{5}$ **B.** $\frac{7}{8}$ **C.** $\frac{3}{5}$ **D.** $\frac{7}{16}$

Question 4H *(2 p.)*

The polynomial $x^4 + 16$ is divisible by the polynomial:

A. $x + 2$ **B.** $x^2 + 4$ **C.** $x^2 - 2\sqrt{2}x + 4$ **D.** $x^2 + 2\sqrt{2}x - 4$

Question 5H *(2 p.)*

Let $\log_2 3 = a$. Then the number $\log_{\sqrt{6}} 2 \cdot \log_{\sqrt{3}} 6$ is equal to:

A. $\frac{4}{a}$ **B.** $\frac{a}{a+1}$ **C.** $1 + \frac{1}{a}$ **D.** $\frac{a}{2}$

Question 6H *(2 p.)*

The limit of the sequence $a_n = \dfrac{1 + 4 + 7 + \cdots + (3n-2)}{2 + 4 + \cdots + 2n}$ is equal to:

A. $\frac{1}{4}$ **B.** $\frac{1}{2}$ **C.** 1 **D.** $\frac{3}{2}$

Question 7H *(2 p.)*

From the set of digits $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ two are drawn at random without returning. The probability that their product is divisible by 8 is equal to:

A. $\frac{1}{3}$ **B.** $\frac{19}{45}$ **C.** $\frac{19}{90}$ **D.** $\frac{6}{15}$

Question 8H *(2 p.)*

Points $A(-1, -3)$ and $B(1, 3)$ are two vertices of an equilateral triangle. Then the third vertex of this triangle, located in the second quadrant of the coordinate system, is:

A. $C(-3, 1)$ **B.** $C\left(-\frac{5}{2}, \frac{1}{2}\right)$ **C.** $C(-3\sqrt{3}, \sqrt{3}),$ **D.** $C(-2\sqrt{3}, 2)$