University of Belgrade
Faculty of Organizational Sciences

28 June 2016

MATHEMATICS ENTRANCE EXAM

The test contains 20 questions on 2 pages. Each question is worth 5 points. If you do not wish to choose one of the first five offered answers, you may mark "N", which is worth 0 points. For an incorrect answer, 0.5 points are deducted. If, for a given question, more than one answer is marked or no answer is marked, as well as if the answer is marked incorrectly in any way, 1 point is deducted.

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1. The value of the expression $\dfrac{(\sqrt{2^4}+\sqrt[3]{2^6})\cdot 2^{-1}+(-3)^2-1}{\sqrt{(-2)^2}-\sqrt[5]{(-2)^5}}$ is equal to:

A) 5; B) $\frac{1}{2}$; (C) 3; D) 1; E) $\frac{1}{4}$; N) I don't know.

2. After two price increases, first by 20% and then by 30%, the price of a mathematics textbook is 1482 dinars. The price of the textbook before these increases was:

A) 1000 dinars; B) 900 dinars; C) 925 dinars; D) 975 dinars; (E) 950 dinars; N) I don't know.

3. Let $f(x)=\dfrac{x+2}{x-2}$ for $x\neq 2$ and $g(x)=f(f(x))+f(x-4)$ for $x\neq 6$. Then:

A) $g(x)=\dfrac{x-2}{x-6}$; (B) $g(x)=\dfrac{2x}{6-x}$; C) $g(x)=\dfrac{2x}{x-6}$; D) $g(x)=\dfrac{x-2}{6-x}$; E) $g(x)=\dfrac{3x-2}{6-x}$; N) I don't know.

4. If a complex number z satisfies the equation $2z+\bar{z}+|z+3i|=16-3i$, where $i^2=-1$, then:

A) $|z|=2\sqrt{3}$; B) $|z|=4$; C) $|z|=3$; D) $|z|=3\sqrt{3}$; (E) $|z|=5$; N) I don't know.

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5. For $a>0$, $b>0$ and $a\neq b$, the expression $\left(\dfrac{a+\sqrt{ab}+b}{\left(\sqrt{a}^3-\sqrt{b}^3\right)\left(\sqrt{a}+\sqrt{b}\right)}+\dfrac{1}{a+b}\right):\dfrac{ab}{a^2-b^2}$ is identically equal to the expression:

(A) $\frac{2}{b}$; B) $\frac{1}{a}$; C) $\frac{1}{b}$; D) $\frac{2}{ab}$; E) $\frac{2}{a}$; N) I don't know.

6. If the solutions x_1 and x_2 of the equation $4x^2-2mx+m-3=0$ satisfy the equality $\dfrac{1}{x_1^2}+\dfrac{1}{x_2^2}=4$, then the value of the parameter m belongs to the interval:

A) $(3,4)$; (B) $(0,1)$; C) $(4,5)$; D) $(2,3)$; E) $(1,2)$; N) I don't know.

7. Parallel sides of a square belong to the lines $4x-3y+15=0$ and $8x-6y+21=0$. The length of the diagonal of that square is equal to:

(A) $\frac{9\sqrt{2}}{10}$; B) $\sqrt{2}$; C) $\frac{4}{3}$; D) $\frac{4\sqrt{2}}{5}$; E) $\frac{3}{2}$; N) I don't know.

8. The remainder obtained by dividing the polynomial $P(x)=x^{2016}-x^{2015}-1$ by the polynomial x^2+1 is equal to:

A) $x+1$; (B) x; C) $-x+1$; D) 1; E) $-x$; N) I don't know.

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9. If $a = \log_2 \sqrt[5]{64} - \sqrt{2}^{\log_8 5}$, then the value of the expression $\left(a - \frac{6}{5}\right)^6$ is equal to:

(A) 5; B) 1; C) $\frac{1}{5}$; D) $\frac{1}{25}$; E) 25; N) I don't know.

10. The number of all integer solutions of the inequality $(\sqrt{5}+2)^x + (\sqrt{5}-2)^x \leqslant 2\sqrt{5}$ is equal to:

A) 4; B) 5; C) 1; D) 7; (E) 3; N) I don't know.

11. The sum of the largest negative and the smallest positive solution of the equation $\frac{2\sin x + 1}{\sqrt{\cos x}} = 0$ is equal to:

A) $\frac{7\pi}{6}$; B) $\frac{11\pi}{6}$; (C) $\frac{5\pi}{3}$; D) $\frac{4\pi}{3}$; E) π; N) I don't know.

12. In an isosceles trapezoid $ABCD$, the angle between the leg AD and the diagonal BD is $90°$. If the lengths of the bases of the trapezoid are 6 cm and 3 cm, then the area of the given trapezoid is equal to:

A) 12 cm^2; B) $6\sqrt{3}$ cm^2; C) $\frac{15\sqrt{2}}{2}$ cm^2; (D) $\frac{27\sqrt{3}}{4}$ cm^2; E) $9\sqrt{2}$ cm^2; N) I don't know.

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13. A geometric progression $a_1, a_2, a_3, \ldots$ is given. If $a_5 - a_2 = 756$ and $a_2 + a_3 + a_4 = 252$, then $a_1 + a_2$ is equal to:

A) 5; B) 20; C) 25; (D) 15; E) 10; N) I don't know.

14. The product of all real solutions of the equation $x^{\log_2 x} = 16$ is equal to:

(A) 1; B) $\frac{1}{2}$; C) $\frac{1}{4}$; D) 2; E) 4; N) I don't know.

15. The set of all solutions of the inequality $\sqrt{3x^2 + 11x - 4} < x + 1$ is:

A) $[1/3, 2/5)$; B) $[2/5, 1/2)$; C) $[1/6, 1/2)$; D) $[1/3, 3/5)$; (E) $[1/3, 1/2)$; N) I don't know.

16. The value of the expression $\sin 6° - \sin 42° - \sin 66° + \sin 78°$ is equal to:

A) $\frac{\sqrt{2}}{2}$; B) $-\frac{\sqrt{2}}{2}$; C) $\frac{1}{2}$; D) 0; (E) $-\frac{1}{2}$; N) I don't know.

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17. The number of all values of the natural number n for which the expansion of $(\sqrt{x} + \sqrt[3]{x})^n$ contains a term of the form $m \cdot x^7$, $m \in \mathbb{Z}$, is equal to:

A) 6; B) 4; (C) 8; D) 7; E) 10; N) I don't know.

18. The area of the base of a right triangular prism is 4 cm^2, and the areas of the lateral faces are 9 cm^2, 10 cm^2 and 17 cm^2. The volume of the given prism is equal to:

A) 8 cm^3; B) 20 cm^3; C) 24 cm^3; (D) 12 cm^3; E) 16 cm^3; N) I don't know.

19. The maximum volume of a right regular quadrilateral pyramid with surface area P is equal to:

A) $\frac{P\sqrt{P}}{12\sqrt{3}}$; (B) $\frac{P\sqrt{P}}{12\sqrt{2}}$; C) $\frac{P\sqrt{P}}{16}$; D) $\frac{P\sqrt{P}}{18}$; E) $\frac{P\sqrt{P}}{12}$; N) I don't know.

20. The number of all permutations of the letters in the word MOSKVA such that there is at least one consonant between the two vowels is equal to:

A) 450; (B) 480; C) 520; D) 560; E) 600; N) I don't know.
