

Entrance test

FCS UNIPi - Math 0 class

September 10th, 2020

Instructions

Write not only the solutions **but also the reasoning and the computations for every exercise**. If possible, use plain white paper. The allotted time for the test is 2 hours. When you have completed the test please take photos, in the correct order if possible, and send them with **one** email to the address caboara@dm.unipi.it using the subject **FCS-your family name**. You will receive your grade as soon as possible. The grade only use will be to decide if the Math 0 class could be useful to you.

1. Compute $4/12 - 15/24$.
2. Is it true that $\sqrt{3} + \sqrt{5} > \sqrt{8}$?
3. Compute $(1/\sqrt{5} + \sqrt{3})^2$. **NEW**
4. Solve, considering existence conditions, the equation $\frac{\sqrt{x^3+x}}{x} = 0$
5. Solve, considering existence conditions, the equation $\frac{x^4-16}{x^2-4} = 0$.
6. Simplify $\frac{a^2-b^2+a+b}{a-b+1}$
7. Find the greater common divisor and the least common multiple of the integers 64, 84. **NEW**
8. Find the greater common divisor and the least common multiple of the polynomials $x^2 - 1$, $x^4 - 1$.
9. Solve $15x - 12 = 0$.
10. Solve $x^2 + 2x - 15 = 0$.
11. Solve $2 - 3x > 0$.

12. Solve $x^2 - 4 \leq 0$. **NEW** $\boxed{-2 \leq x \leq 2}$

13. Solve, considering existence conditions, $\frac{x-3}{x+1/2} \leq 0$. $\boxed{x \in (-1/2, 3)}$

14. Simplify $\frac{x^2 - 6x + 8}{x^2 - 4x + 4} \cdot \frac{x+2}{x-2}$

15. Draw on the Cartesian plane the line for $A : (1, 1)$, $B : (-1, 3)$. **NEW**

16. Draw on the Cartesian plane the parabola $f(x) = x^2 - 3x + 2$.

17. Solve graphically the inequality $x^2 < \sqrt{x}$.

18. Given the function $f(x) = x^2 - 4$, find $f(0)$ and $f^{-1}(0)$. **NEW** $\boxed{-4, \{\pm 2\}}$

19. Simplify and calculate

$$\left[\left(\frac{15}{25} - \frac{2}{6} \right) \cdot \frac{9}{12} + \left(\frac{4}{15} - \frac{11}{45} \right) \cdot \frac{10}{2} \right] : \frac{7}{9}$$

$$\boxed{2/5}$$

20. Draw on the Cartesian plane the triangle $ABAC'$, where $A = (0, 0)$, $B = (0, 1)$, $C = (1, 0)$. Find the area and the perimeter of the triangle.

$$\boxed{1/2, 2 + \sqrt{2}}$$

21. Draw on the Cartesian plane the triangle ABC , where $A = (-1, 2)$, $B = (0, 5)$, $C = (2, 2)$. Find the area and the perimeter of the triangle.

$$\boxed{9/2, 3 + \sqrt{10} + \sqrt{13}}$$

22. Solve, considering existence conditions, the inequality $\frac{1}{x+1} < \frac{1}{x^2+1}$.

$$\boxed{x \in (-\infty, -1) \cup (0, 1)}$$

23. Compute the area and perimeter of the circle with center in $C : (0, 3)$ and that intersects the line $x = 0$ at the origin $O : (0, 0)$. **NEW**

$$\boxed{A = 9\pi, P = 6\pi}$$

24. Put in rational standard form $\frac{1}{\sqrt{3} - \sqrt{2}} \cdot \boxed{\sqrt{3} + \sqrt{2}}$

25. Put in rational standard form $\frac{1}{\sqrt[3]{2} - 1} \cdot \boxed{1 + \sqrt[3]{2} + \sqrt[3]{4}}$