Theta Radicals National MAΘ 2008

NOTA = None of the Above

1. Solve for x: $\sqrt{6-x}=x$.

A. $\{2\}$ B. $\{-3\}$ C. $\{2,-3\}$ D. $\{3\}$ E. NOTA

2. Evaluate: $\sqrt{3-\sqrt{3-\sqrt{3-...}}}$.

A. 3 B. $\sqrt{3}$ C. $\ln(3)$ D. $\frac{\sqrt{13}-1}{2}$ E. NOTA

3. Solve for x: $\sqrt{2x^2-7}=3-x$.

A. $\{-8\}$ B. $\{2,8\}$ C. $\{-8,2\}$ D. $\{2\}$ E. NOTA

4. Find the sum of all x that are solutions of: $\sqrt{2x+9}+\sqrt{x+1}=\sqrt{x+4}$.

A. -5 B. 0 C. 5 D. 25 E. NOTA

5. Solve for x: $x-1=\sqrt[4]{x^4-4x^3+x+5}$.

A. $\left\{-\frac{1}{2}\right\}$ B. $\left\{-\frac{1}{2},-\frac{4}{3}\right\}$ C. $\left\{-\frac{4}{3}\right\}$ D. $\varnothing$ E. NOTA

6. A bouncy ball is dropped from a height of 5ft. It rebounds at exactly $\frac{\sqrt{2}}{4}$ of its height from the prior bounce. How much distance will the ball travel if this continues indefinitely?

A. $\frac{40+10\sqrt{2}}{7}$ B. $\frac{5+20\sqrt{2}}{7}$ C. $\frac{36}{7}$ D. $\frac{45+20\sqrt{2}}{7}$ E. NOTA

7. Consider these two numbers $\sqrt{2}$ and $\sqrt[3]{3}$. Which is larger?

A. $\sqrt{2}$ B. $\sqrt[3]{3}$ C. neither D. Cannot be determined E. NOTA

8. The number $\sqrt{8+\sqrt{60}}$ can be written $\sqrt{a}+\sqrt{b}$ where $a > b$. Find $a - b$.

A. 8 B. 6 C. 4 D. 2 E. NOTA

9. What is the domain for the function $f(x)=\sqrt{3-x^2}$?

A. $\left\{x\middle|x\in\left[\sqrt{3},\infty\right)\right\}$ B. $\left\{x\middle|x\in\left[0,\sqrt{3}\right]\right\}$ C. $\left\{x\middle|x\in\left(-\infty,\sqrt{3}\right)\cup\left(\sqrt{3},\infty\right)\right\}$

D. $\left\{x\middle|x\in\left[-\sqrt{3},\sqrt{3}\right]\right\}$ E. NOTA

10. What is the range of that same function $f(x)=\sqrt{3-x^2}$?

A. $\left\{y\middle|y\in\left[\sqrt{3},\infty\right)\right\}$ B. $\left\{y\middle|y\in\left[0,\sqrt{3}\right]\right\}$ C. $\left\{y\middle|y\in\left(-\infty,\sqrt{3}\right)\cup\left(\sqrt{3},\infty\right)\right\}$

D. $\left\{y\middle|y\in\left[-\sqrt{3},\sqrt{3}\right]\right\}$ E. NOTA

11. Solve for x over the reals: $\log\sqrt{x}=\sqrt{\log x}$.

A. 10 B. 100 C. 1000 D. 10000 E. NOTA

12. What is the distance between the points in the coordinate plane: $(-2,3)$ and $(5,19)$

A. $\sqrt{13}$ B. $\sqrt{113}$ C. $\sqrt{305}$ D. $\sqrt{386}$ E. NOTA

13. Which number is considered irrational?

A. ∞ B. $\sqrt{2+\sqrt{2+\sqrt{2+...}}}$ C. $.33\overline{3}$ D. π E. NOTA

14. Simplify: $\dfrac{1}{\sqrt[3]{a^2}-\sqrt[3]{ab^2}+\sqrt[3]{b^4}}$.

A. $\dfrac{\sqrt[3]{a}+\sqrt[3]{b}}{a-b}$ B. $\dfrac{\sqrt[3]{a}+\sqrt[3]{b^2}}{a-b^2}$ C. $\dfrac{\sqrt[3]{a}-\sqrt[3]{b}}{a+b}$ D. $\dfrac{\sqrt[3]{a}+\sqrt[3]{b}}{a+b}$ E. NOTA

15. Evaluate: $\left|1+i\sqrt{3}-z_0\right|$ when $z_0=\sqrt{3}+i$.

A. $\sqrt{6}-\sqrt{2}$ B. $\sqrt{12-\sqrt{12}}$ C. $\sqrt{3}+\sqrt{2}$ D. $3i+\sqrt{3}$ E. NOTA

16. Solve for ©: $\sqrt{©^2-©-12}^{\left(©^2-©-2\right)}=\sqrt{©^2-5©+4}^{\left(©^2+4©+3\right)}$.

A. $\{-1,4\}$ B. $\{0,4\}$ C. $\{-1,2\}$ D. $\{1,4\}$ E. NOTA

17. Solve for *y* and write the solution in interval notation: $\sqrt{y-1}>y-3$.

A. $[1,5)$ B. $(1,5)$ C. $[1,5]$ D. $(1,5]$ E. NOTA

18. The lengths of two of the sides of a given triangle are $\sqrt{3}$ and $\sqrt{5}$. Which length could be the third side of this triangle?

A. 0.25 B. 0.5 C. 4 D. 8 E. NOTA

19. Solve for *x* and write the solution in interval notation: $|x-2|\geq\sqrt{x+4}$

A. $[0,\infty)$ B. $[0,5]$ C. $[-4,0]\cup[5,\infty)$ D. $(0,5)$ E. NOTA

20. Evaluate: $\dfrac{2}{\sqrt{3-\dfrac{2}{\sqrt{3-\dfrac{2}{\sqrt{3-...}}}}}}$.

A. 3 B. 2 C. 1 D. – 1 E. NOTA

21. Find $\sqrt{M}$ where $M=\begin{vmatrix}7 & 6\\ 2 & 3\end{vmatrix}$.

A. 0 B. ± 3 C. $\sqrt{33}$ D. 3 E. NOTA

22. Find the sum of all solutions for *x*: $x^2\sqrt{x}-2x^2-3x\sqrt{x}+6x=0$

A. 0 B. 3 C. 7 D. 8 E. NOTA

23. Let $\sqrt{3}=1.a_1a_2a_3a_4...$ where each $a_k, k=1,2,3...$ represents a digit of $\sqrt{3}$. What does a_3 equal?

A. 0 B. 1 C. 2 D. 3 E. NOTA

24. Solve for x over the reals: $\sqrt{x+13} = x-7$.

A. $\{-3\}$ B. $\{12\}$ C. $\{3,12\}$ D. $\{3\}$ E. NOTA

25. Find the sum of all solutions for y over the reals: $\sqrt{3-y} - \sqrt{y+7} = 4$.

A. – 6 B. – 4 C. 2 D. 8 E. NOTA

26. Find the value of $\frac{\sqrt{x^2+5x-14}}{\sqrt{2x^2-5x-3}} \cdot \frac{\sqrt{x^2-5x+6}}{\sqrt{x^2+6x-7}} \cdot \frac{\sqrt{x^2+2x-3}}{\sqrt{2x^2+7x+3}}$ when x = 10.

A. 1 B. $\frac{8}{21}$ C. $\frac{6}{7}$ D. $\sqrt{17}$ E. NOTA

27. There are more radical individuals in California than the rest of the United States combined. Still none of them come close to Dr. Morris. His radical quotient, or R.Q., varies directly with the square root of the number of tests in a competition and indirectly with the cube of how quickly those tests were written (measured in years prior to the competition). His R.Q. for Nationals 2006, when there were 36 tests that were completed within 1.2 years of the competition, was 250. For Nationals 2008, suppose there are 49 tests that were completed within 4 months of the competition. Then what is Dr. Morris's R.Q. as you are taking this test?

A. 13608 B. 1944 C. 1512 D. 7.875 E. NOTA

28. Simplify and Rationalize: $\frac{2}{1+\sqrt{3}}$.

A. $\frac{1+\sqrt{3}}{4}$ B. $\sqrt{3}-1$ C. $\frac{1-\sqrt{3}}{2}$ D. $\frac{\sqrt{3}}{2}$ E. NOTA

29. What natural number best approximates the following: $\sqrt{1136}$?

A. 28 B. 30 C. 32 D. 34 E. NOTA

30. Evaluate: $\sqrt{2}^{\sqrt{2}^{\sqrt{2}^{\cdot^{\cdot^{\cdot}}}}}$.

A. 1 B. 2 C. ∞ D. π E. NOTA