# UNCC 2001 Algebra II

## March 5, 2001

1. Compute the sum of the roots of $x^2 - 5x + 6 = 0$.

   **(A)** 3    **(B)** 7/2    **(C)** 4    **(D)** 9/2    **(E)** 5

2. Compute the sum of all the roots of $(2x + 3)(x - 4) + (2x + 3)(x - 6) = 0$.

   **(A)** 7/2    **(B)** 4    **(C)** 7    **(D)** 13    **(E)** none of **A**, **B**, **C** or **D**

3. The radius of the circle given by

$$x^2 - 6x + y^2 + 4y = 36$$

   is

   **(A)** 5    **(B)** 6    **(C)** 7    **(D)** 8    **(E)** 36

4. Suppose that $\sqrt{x + 1} = 1 - x$. Which of the following statements is correct?

   **(A)** There are no solutions.

   **(B)** There are two solutions. The larger solution is greater than 2.

   **(C)** There are two solutions. The larger solution is less than or equal to 2.

   **(D)** There is only one solution. This solution is greater than 2.

   **(E)** There is only one solution. This solution is less than 2.

5. Solve the following equation for $x$:

$$\frac{\sqrt{x + 1} + \sqrt{x - 1}}{\sqrt{x + 1} - \sqrt{x - 1}} = 3.$$

   **(A)** 0    **(B)** 5/3    **(C)** 1    **(D)** 3/5    **(E)** 3

6. If $2^{10x-1} = 1$, what is $\log x$?

   **(A)** $-1$    **(B)** 0    **(C)** 1    **(D)** 2    **(E)** 3

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7. The equation $\sqrt{(x+7)} + x = 13$ has

   (A) no roots  (B) one root  (C) two roots  (D) three roots  (E) none of A, B, C, or D

8. How many real solutions of the system $x - y = 3$, $x^2 - y = -1$ are there?

   (A) none  (B) 1  (C) 2  (D) 3  (E) infinitely many

9. Find the base $a$ for which $\log_a 2 = \sqrt[3]{8}$

   (A) $a = \sqrt{2}$  (B) $a = 2$  (C) $a = 4$  (D) $a = \sqrt[3]{2}$  (E) $a = \dfrac{1}{3}$

10. If the sides of a square are each increased by 12 inches, the area is increased by 200 square inches. The length of a side of the original square is

    (A) 2 inches  (B) $2\frac{1}{3}$ inches  (C) $10\frac{1}{2}$ inches  (D) $3\frac{2}{3}$ inches  (E) $2\frac{1}{4}$ inches

11. Determine $m$ such that $x^3 - 5x^2 + 7x + (m - 5)$ is divisible by $(x - 4)$

    (A) $-7$  (B) 0  (C) 5  (D) 7  (E) 17

12. If $x^2 + 2x + n > 10$ for all real numbers $x$, then which of the following conditions must be true?

    (A) $n > 11$  (B) $n < 11$  (C) $n = 10$  (D) $n = \infty$  (E) $n > -11$

13. The product of four different integers, exactly three of which are odd, is 7!. The sum of the four integers is 63. What is the largest of the four integers?

    (A) 35  (B) 48  (C) 64  (D) 72  (E) 105

14. What is the largest integer $k$ such that

$$\frac{3}{2} \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4} \cdots \cdot \frac{k}{k+1} \geq \frac{1}{8}$$

    (A) 20  (B) 21  (C) 23  (D) 24  (E) 26

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15. What is the sum of all integers $x$ that satisfy

$$-5 \le x/\pi \le 10?$$

(A) 312    (B) 324    (C) 346    (D) 376    (E) 412

16. It takes 6 hours for vote counter $A$ to count a bucket of votes. If vote counter $B$ is assigned to help $A$ with the count, it takes 4 hours. How long does it take vote counter $B$ to count a bucket of votes alone?

(A) 2 hours    (B) 10 hours    (C) 12 hours    (D) 24 hours    (E) 8 hours

17. A circle $C$ contains the points $(0,6), (0,10)$, and $(8,0)$. What is the second $x$-intercept?

(A) 7.00    (B) 7.25    (C) 7.50    (D) 7.75    (E) 9.00

18. What is the $x$-intercept of the line $L$ satisfying

- $L$ is perpendicular to the line defined by $3x - 2y = 6$, and
- the $y$-intercept of $L$ is 2.

(A) 1    (B) 2    (C) 2.4    (D) 3    (E) 3.2

19. The number of zeroes at the end of 45! is

(A) 8    (B) 9    (C) 10    (D) 11    (E) 12

20. How many positive divisors does 6! have?

(A) 4    (B) 6    (C) 10    (D) 20    (E) 30

21. If $x$ is 150% of $y$, what percent of $3x$ is $4y$? Round your answer to the nearest whole number.

(A) 75    (B) 79    (C) 89    (D) 92    (E) 112

22. How many positive integers can be represented as a product of two distinct members of the set $\{1, 2, 3, 4, 5, 6\}$?

(A) 9     (B) 10     (C) 11     (D) 12     (E) 13

23. What is the largest possible product of three distinct members of the set $\{2/3, -2/3, 4/5, 1, -1, 5/4\}$?

(A) $-1$     (B) $-2/3$     (C) $4/5$     (D) $1$     (E) $5/4$

24. Another way to write $(a^{-1} + b^{-1})^{-1}$ is

(A) $\dfrac{(a + b)}{ab}$     (B) $\dfrac{1}{a} + \dfrac{1}{b}$     (C) $\dfrac{ab}{(a + b)}$     (D) $a + b$     (E) $ab$

25. Determine $k$ so that the roots of $x^2 + 2kx - 1 = 2k$ will be equal.

(A) $-1$     (B) $1$     (C) $i$     (D) $-i$     (E) $\pm\sqrt{2}$

26. The coefficient of the term involving $x^8$ in the expansion of $(x^2 + 3y)^{10}$ is:

(A) $(3^7)(70)$     (B) $(3)(70)$     (C) $(3^7)(5)$     (D) $(3^6)(5)$     (E) none of A, B, C or D

27. Three packages of coffee cost a total of $10.20. The first costs $0.30 more than the second, and the second costs $0.66 less than the third. How much did the second package cost?

(A) $3.52     (B) $2.86     (C) $3.82     (D) $3.08     (E) $3.38

28. How many pounds of $H_2O$ must be evaporated from 50 pounds of a 3% solution so that the remaining solution will be 5% salt?

(A) 1.6     (B) $5\dfrac{1}{3}$     (C) 9.6     (D) $13\dfrac{1}{3}$     (E) 20