

February 14, 2000

Your name _____

The first 16 problems count 5 points each and the final two count 20 points each. Problems 2 through 10 are multiple choice and 11 through 16 are fill-in-the-blank. In the multiple choice section, circle the correct choice. You do not need to show your work on problems 2 through 15.

1. Fill in the three character code you received via email in the box
2. Simplify: $3x - 3[x + 3 - (4x - 1)] + 2$
(A) $12x - 12$ (B) $12x - 10$ (C) $4x - 12$
(D) $-2x - 12$ (E) $-5x - 10$
3. When the product $(4x + 3) \cdot (x^2 + x - 3)$ is written in the form $ax^3 + bx^2 + cx + d$, what is the value of c ?
(A) -9 (B) 2 (C) 3 (D) 4 (E) 7
4. Compute and simplify $\frac{s^2 + 5s - 6}{s^2 + 9s + 18} \div \frac{s^2 - 1}{s^2 + 7s + 12}$.
(A) $\frac{s - 1}{s + 1}$ (B) $\frac{s + 4}{s + 1}$ (C) $\frac{s - 1}{s + 6}$ (D) $\frac{s + 3}{s - 1}$ (E) $\frac{s + 6}{s + 1}$
5. What is the sum of the solutions of $2x^3 + 5x^2 - 3x = 0$?
(A) $-3\frac{1}{2}$ (B) $-2\frac{1}{2}$ (C) 0 (D) $2\frac{1}{2}$ (E) $3\frac{1}{2}$
6. What is the exact value of $|3\sqrt{2} - 5| + |1 - 2\sqrt{2}|$?
(A) $6 + 5\sqrt{2}$ (B) $\sqrt{2} - 4$ (C) $4 - \sqrt{2}$ (D) $5\sqrt{2} - 4$ (E) $4 + 5\sqrt{2}$
7. Ashley is a salesperson in a retail store. She earns \$140 weekly plus a 10% commission on her weekly sales. Let s denote her weekly sales. Which of the following best describes her income?
(A) $140s$ (B) $14s$ (C) $140 + s$ (D) $140 + 0.1s$ (E) $0.1(s + 140)$
8. $(4^{-1} - 5^{-1})^{-1} =$
(A) -20 (B) -1 (C) $\frac{1}{20}$ (D) 4 (E) 20

9. How many positive integers satisfy the inequality $(x+3)(2x-3)(2x-15) \leq 0$?

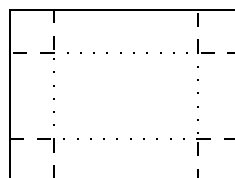
- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7

10. The expression $(2x-3) \cdot (4x+1) - (2x-3) \cdot 4x + 1$ is equivalent to

- (A) 0 (B) $2x-4$ (C) $2x-3$ (D) $2x-2$ (E) None of the above

The next few questions are short answer questions. Write your answer in the blank provided.

11. A topless box is built from a 12 inch by 14 inch sheet of paper by cutting from each corner a 2 inch by 2 inch square. The four squares are discarded and the flaps are folded upwards to form the sides of the box. What is the volume of the box?



12. Niki has forgotten the relationship between Fahrenheit scale and the Celsius scale. She guesses to double the Celsius and then to add 30 degrees. The actual relationship is given by $F^\circ = \frac{9}{5}C^\circ + 32^\circ$, where F is the Fahrenheit temperature and C is the Celsius temperature. At what Celsius temperature does Niki's method produce the right Fahrenheit temperature?

13. Suppose a is a real number such that $(a-3)(a^2+3) = 0$. What is the value of $|a - a^2|$?

14. The sum of two real numbers is 12 and their product is 20. What is the sum of their reciprocals?

15. The number $6^9 \cdot 9^6 \cdot 6^6 \cdot 9^9$ can be written as A^B , where A and B are integers (whole numbers). Write A^B in the blank. $\boxed{54^{15}}$
16. Find all solutions to $x^4 - 3x^2 + 2 = 0$ Factor to get $(x^2 - 1)(x^2 - 2) = 0$ from which we get the four solutions $x = \pm 1$; $x = \pm\sqrt{2}$.
- On all the following questions, **show your work.**
17. Find all x satisfying the inequality $(x - 2)(x + 2)(3x + 4) \leq 0$.

Answer: Test the intervals $(-\infty, -2)$, $(-2, -4/3)$, $(-4/3, 2)$, $(2, \infty)$ to find that the product in question is negative on the first and third of the intervals, ie, $(-\infty, -2] \cup [-4/3, 2)$.

18. Solve by completing the square the equation $2x^2 - 3x - 4 = 0$. Correct use of the quadratic formula is worth 4 points.

Solution. Subtract 4 from both sides, then divide by 2 and finally add $9/16$ to both sides to get $x^2 - 3x/2 + 9/16 = 2 + 9/16$. The answers follow: $x = \frac{3 \pm \sqrt{41}}{4}$.