

September 18, 2002

Your name _____

The first 11 problems count 5 points each and the final ones counts as marked. In the multiple choice section, circle the correct choice (or choices). You do not need to show your work on multiple choice items. You must show your work on the other problems. The total number of points available is 131.

1. Fill in the three character code you received via email in the box

2. $\frac{9^{12} - 9^{11}}{8} =$

(A) $\frac{1}{8}$ (B) $\frac{9}{8}$ (C) 9^3 (D) $\frac{9^{11}}{8}$ (E) 9^{11}

3. If $\sqrt{2 + \sqrt{x}} = 3$, then $x =$

(A) 1 (B) 7 (C) 11 (D) 49 (E) 121

4. Tom is three years older than Sue. The sum of their ages is 15. Given that Tom's age is x years, which of the equations could be solved to find x ?

(A) $x = 15 - 3$ (B) $x + (x - 3) = 15$ (C) $x + 3x = 15$

(D) $x + (x + 3) = 15$ (E) $x = 15 + (x - 3)$

5. What is the exact value of $|\sqrt{3} - 2| + |3\sqrt{3} - 6|$?

(A) $4\sqrt{3} - 8$ (B) $4\sqrt{3} + 8$ (C) $8 - 4\sqrt{3}$ (D) 1.07 (E) $4 - 2\sqrt{3}$

6. $3^3 \cdot 6^3 \cdot 3^6 \cdot 6^6 =$

(A) 9^9 (B) 9^{18} (C) 18^9 (D) 18^{18} (E) 324^{18}

7. What is the product of the roots of $(x - 1)(x - 2) + (x - 2)(x - 5) = 0$?

(A) 2 (B) 6 (C) 10 (D) 12 (E) 20

8. Which of the following is a factor of $x^4 + x$? Circle all those that apply.

- (A) x (B) $x - 1$ (C) $x + 1$ (D) $x^2 + x + 1$ (E) $x^2 - x + 1$

9. What is the sum of the two roots of $2x^2 - 13x + 15 = 0$?

- (A) $3/2$ (B) 5 (C) 6.5 (D) 7 (E) 9.5

10. How many roots does the equation below have?

$$x^2(x^2 - 3) - 4(x^2 - 3) = 0$$

- (A) 0 (B) 1 (C) 2 (D) 3 (E) 4

11.

$$\frac{1 + \frac{1}{x}}{1 - \frac{1}{x}} =$$

- (A) $\frac{x+1}{x-1}$ (B) $\frac{x-1}{x+1}$ (C) $x-1$ (D) $1-x$ (E) x

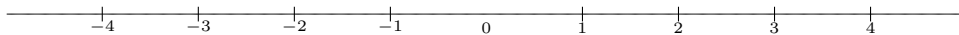
On all the following questions, **show your work**.

12. (10 points) Find the exact value of $(6^{-1} - 5^{-1})^{-1}$. Show your work. Calculator solutions are not acceptable.

13. (20 points) Use the test interval technique to solve the inequality

$$(3x - 4)(2x + 3)(x - 4) \geq 0.$$

Use the number line provided below. Express your answer using interval notation.



14. (10 points) Niki runs at a rate of 800 ft. per minute. Jeff runs at the rate of 900 ft. per minute. If Niki starts 500 feet ahead of Jeff, how long does it take Jeff to catch up with her.
15. (12 points) Solve the equation $3 + \sqrt{3x + 1} = x$.
16. (12 points) Solve the equation $2x^2 - 8x + 7 = 0$ by completing the square.
17. (12 points) Solve the inequality $|2x - 5| \geq 9$.