September 18, 2001 Your name _____

The first 20 problems count 3 points each and the final ones counts as marked. Problems 1 through 20 are multiple choice. 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 119.

1. Fill in the three character code you received via email in the box $\boxed{}$

2. Which of the following belongs to the domain of the function $f(x) = \frac{\sqrt{x-7}}{(x-10)(x-11)}$? Circle all that apply.

   (A) -2 **(B)** 0 **(C)** 5 **(D)** 10 **(E)** 14

3. $\dfrac{10^{12} - 10^{11}}{9} =$

   (A) $\dfrac{1}{9}$ **(B)** $\dfrac{10}{9}$ **(C)** 10^3 **(D)** $\dfrac{10^{11}}{9}$ **(E)** 10^{11}

4. If $x \geq 0$, then $\sqrt{x\sqrt{x\sqrt{x}}} =$

   (A) $x\sqrt{x}$ **(B)** $x\sqrt[4]{x}$ **(C)** $\sqrt[8]{x}$ **(D)** $\sqrt[8]{x^3}$ **(E)** $\sqrt[8]{x^7}$

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

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

6. If $xy \neq 0$, which of the following must be true?

   (A) Either $x > 0$ or $y > 0$ **(B)** Either x or y is an integer

   (C) Neither x nor y is 0 **(D)** Either x or y is 0

   (E) Both x and y are 0

7. What is the remainder when $x^2 + 3x - 5$ is divided by $x - 1$?

   (A) -5 **(B)** -2 **(C)** -1 **(D)** 0 **(E)** 1

8. If $x^2 = y^2$, then which one of the following must be true?

   (A) $x = y$ **(B)** $x = -y$ **(C)** $x^3 = y^3$ **(D)** $|x| = |y|$ **(E)** $\sqrt{x} = \sqrt{y}$

9. Tom is three years older than Sue. The sum of their ages is 15. Given that Sue'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)** $x = 15 + (x - 3)$

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

    (A) $4\sqrt{2} - 7$ **(B)** $4\sqrt{2} + 7$ **(C)** $7 - 4\sqrt{2}$ **(D)** 1.34 **(E)** $3 - 2\sqrt{2}$

11. If $f(x + 1) = x^4 - x + 1$, what is $f(0)$?

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

12. The repeating decimal $0.24242424\ldots = 0.\overline{24}$ has the value m/n where m/n is reduced to lowest terms and m and n are integers. What is $m + n$?

    (A) 36 **(B)** 41 **(C)** 42 **(D)** 46 **(E)** 120

13. When $\frac{4}{x-2} - \frac{x}{x-2}$ is expressed as a simple fraction, the numerator could be

    (A) 4 **(B)** x **(C)** $4 - x$ **(D)** $4 + x$ **(E)** $x - 2$

14. What is the y-intercept of the line L satisfying

    (a) L is parallel to the line defined by $4x - 2y = 3$, and

    (b) L contains the point $(-2, -1)$.

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

15. 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)** $x^2 - x + 1$

16. How many roots does the equation below have?

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

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

17.
$$\frac{1 + \frac{1}{x}}{1 - \frac{1}{x}} =$$

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

18. Niki was paid time-and-a-half for hours worked in excess of 40 per week. She earned \$416 during a week in which she worked 48 hours. What was her hourly wage?

    (A) \$6.00 **(B)** \$6.50 **(C)** \$7.00 **(D)** \$8.00 **(E)** \$8.50

19. Which of the following is the sum of the two roots of $6x^2 + 7x - 10 = 0$?

    (A) $-7/6$ **(B)** $-1/10$ **(C)** $7/10$ **(D)** 1.1 **(E)** $2\dfrac{1}{6}$

20. $(5^{-1} - 4^{-1})^{-1} =$

    (A) -20 **(B)** -4 **(C)** 1 **(D)** $\dfrac{1}{20}$ **(E)** 20

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

21. (5 points) Simplify: $4x(1-x)-3[x+3-(2x-1)]$

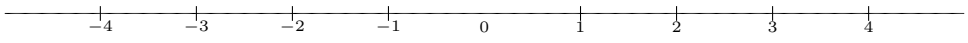
22. (7 points) The points $A=(0,0), B=(8,0)$, and $C=(3,7)$ are the vertices of triangle. Find the length of the longest side.

23. (12 points) Solve the equation $2x^2-8x+7=0$ by completing the square.

24. (20 points) Use the test interval technique to solve the inequality

$$(x-3)(x+2)(x-1) \geq 0.$$

Use the number line provided below.



25. (15 points) Solve the inequality $|2x - 5| \geq 9$.