2025 MATH FIELD DAY : ALGEBRA II

Name: _____ School: _____

Place all answers in the blank space provided in simplified, exact form. **You are not expected to answer all the questions.**

1. _____ Solve over the set of Real Numbers: $20x^2 - 5x^3 = -25x$.

2. _____ Solve the system of equations: $x^2 - y^2 = 20, x^2 - 4y = 25$

3. _____ Write the standard equation of a circle with center at (-2,-5) and is tangent to the y-axis.

4. _____ Find the lowest point on the curve $y = \frac{1}{20}x^2 - \frac{1}{25}x - \frac{1}{5}$.

5. _____ Solve: $\sqrt{20x - 25} - 7 \geq 13$

6. _____ Solve for x: $\log_6(x-1) - \log_6(x+6) = \log_6(x-2) - \log_6(x+3)$

7. _____ Write the first two terms in the expansion of $(4x - 5)^{13}$

8. _____ If $f(x) = x^3 - 2x^2 - 5$, then find $\frac{f(x+h) - f(x)}{h}$ with no factor of h in the denominator.

9. _____ Find the domain of $(f \circ g)(x)$ given $f(x) = \frac{2}{2x+5}$ and $g(x) = \frac{x+2}{x-5}$.

10. _____ Write an equation for a parabola with vertex $(-2, -5)$ and going through $(2, 0)$.

11. _____ Find all roots of $\frac{2}{x-3} = \frac{5x^2}{x^2-9} - \frac{x}{x+3}$

12. _____ Find all the zeroes of $f(x) = 10x^4 - 31x^3 + 105x^2 - 279x + 135$ over the set of complex numbers.

13. _____ Write an equation for the ellipse with the following conditions: major axis 25 units long and parallel to the y-axis, minor axis 20 units long, center at $(-2, -5)$.

14. _____ Find the indicated term of the arithmetic sequence (assume the sequence starts at a_1): a_{2025} where the sequence is $-26, -13, 0, 13, ...$

15. _____ Evaluate $390625^{\frac{7}{8}}$

16. _____ Solve $2x^{\frac{2}{3}} - 5x^{\frac{1}{3}} = 12$