MATH FIELD DAY 2023 Name _____
ALGEBRA II (11TH GRADE) School _____

All answers should be exact. Reduce, where possible. Answers should be in the space to the left of the question.

_____1. An object is thrown from a height of 14 feet, and its height can be modeled by the function $h(t) = -2t^2 + 3x + 14$. After how many seconds will it hit the ground?

_____ 2. Simplify $\sqrt[3]{\frac{125x^9}{81x^4}}$. Eliminate all radicals in the denominator.

_____3. The speed of a stream is 5mph. A boat travels 8 miles upstream in the same time it takes to travel 18 miles downstream. What is the speed of the boat in still water?

_____*4. Factor completely with integer coefficients. $a^9 + a^6 - a^3 - 1$

_____5. Find the fourth term for the binomial expansion of $(2x - 3)^4$

_____6. Solve the inequality: $2x^3 - 3x^2 - 32x + 48 > 0$. Give your answer in interval notation.

_____7. Simplify: $\frac{2+3i}{1-2i}$. Provide your answer in a+b*i* form

_____8. Solve the system of equations $\begin{cases} y = 3x^2 + 4x - 7 \\ 2x - y = -1 \end{cases}$

_____*9. A geometric sequence has a 3rd term of $\frac{9}{4}$ and a 6th term of $\frac{243}{32}$. Write the general rule for the sequence

_____*10. Find the oblique (slant) asymptote for the rational function $\frac{7x^3-5}{7x^2+7x+2}$

_____11. List all possible rational zeros for the function $f(x) = 4x^3 - 11x^2 + 10x - 3$

_____12. Find the composition $f(g(x))$ for $f(x) = \frac{1}{x+2}$ and $g(x) = \frac{2x-1}{x}$. Are they inverse functions?