2016 MATH FIELD DAY NAME ____________________

Exponential and Logarithmic Functions (11^{th} GRADE) SCHOOL ____________________

All answers should be in exact, simplified form unless otherwise stated. Answers should be in the blank to the left of the problem.

1. ______________ Evaluate exactly. $e^{-\ln 23}$

2. ______________ Evaluate exactly. $\ln(e^{\ln e^2})$

3. ______________ Find the equation of the asymptote of the graph $f(x) = -3e^{x-2} + 5$

4. ______________ Find the equation of the asymptote of the graph $f(x) = 2\ln(x-3) - 4$

5. ______________ Find the domain of the function $f(x) = e^{\ln(x+1)} + \ln(4 - x^2)$. Write in interval notation.

6. ______________ Find the inverse function of $f(x) = 2^{-3x+5} + 1$

7. ______________ Simplify the expression. $\ln(x^3 + 8) - \ln(x+2) - \ln(x^2 - 2x + 4)$

8. ______________ Write the expression as a sum, difference, and/or multiples of logarithms. $\ln\left(\frac{(x+3)^5}{\sqrt{z^4(y+1)^2}}\right)$

9. ______________ Find all real and exact solutions. $x^2 \cdot 2^x - 2^x = 0$

10. ______________ Find all real and exact solutions. $\log_2 3 + \log_2 x = \log_2 5 + \log_2(x-2)$.

11. ______________ Final all real and exact solutions. $x^2e^x + 5xe^x - 6e^x = 0$.

12. ______________ The population of the world was estimated to have reached 6.5 billion in April 2006. The population growth rate for the world is estimated to be 1.4%. (Source: U.S. Census Bureau) $P(t) = 6.5(1.014)^t$ represents the world population in billions as a function of the number of years after April 2006. ($t = 0$ represents April 2006). Use the function to estimate the amount of time after April 2006 required for the world population to reach 13 billion. Round to the nearest number of years.

13. ______________ The half-life of radioactive iodine ${}^{131}I$ is 8.04 days. If 10 g of iodine 131 is initially present, then the amount of radioactive iodine still present after t days is approximated by $A(t) = 10e^{-0.0862t}$ where t is the time in days. How long will it take for the amount of ${}^{131}I$ to decay to 0.5 g? Round to the nearest 0.1 day.