Math 104 Name_____
Final

Instructions: Write clearly and neatly. Show all work to receive full credit.

1. (10 pts) Define the following terms using complete sentences.
a. Equation
b. Solution
c. Function
d. Graph of an equation
e. Equivalent equations

2. (10 pts) True/False, circle one.
a. True/False, 0 is a natural number.
b. True/False, 7 is a whole number.
c. True/False, -2 is an integer.
d. True/False, $\sqrt{2}$ is a rational number.
e. True/False, $\frac{0}{-2}=0$.
f. True/False, $\frac{5}{0}=0$.
g. True/False, $4-4(4-4)=0$.
h. True/False, $12\div 3\cdot 4=1$.
i. True/False, -5 is the square root of 25
j. True/False, $|a|=a$.

3. (4 pts) Multiply and simplify $(2+3i)(5-11i)$.

4. (4 pts) Simplify $\left(\frac{4a^2b^{-5}}{3c^{-4}}\right)^{-3}$.

5. (4 pts) Write $\ln\sqrt[3]{\frac{x^2y^5}{z^4}}$ as an equivalent expression involving $\ln x$, $\ln y$, and $\ln z$.

6. (4 pts) Find the equation of the line passing through the points $(-2,5)$ and $(3,-7)$. Put the equation into slope-intercept form.

7. (32 pts) Perform the indicated operation and simplify.
a. $(3x-x^2+5)-(-5x^2+18x-4)$
b. $(x-2)(3x^2-5x+4)$
c. $\frac{x+1}{x^2-1}\div\frac{x+1}{x^2-2x+1}$
d. $\frac{2a}{a^2-1}+\frac{1}{a^2+a}$
e. Simplify $\frac{1-\frac{1}{x}}{1-\frac{1}{x^2}}$
f. $5\sqrt{2}-\sqrt{18}$
g. Rationalize the denominator of $\frac{2}{3+\sqrt{5}}$
h. Find the quotient and remainder for $\frac{x^2+6x-13}{x-5}$. Use long division.

8. (8 pts) Given the function $f(x) = x^2 + 5x + 6$ find the y-intercept, x-intercepts (if any), and vertex. Use that information to sketch the graph of $f(x)$.

9. (8 pts) Solve the following systems of equations. If no solution or an infinite number of solutions state so.

a. $\begin{aligned} x + y &= -7 \\ 3x + y &= -9 \end{aligned}$

b. $\begin{aligned} x &= 2y + 1 \\ 3x - 6y &= 2 \end{aligned}$

10.(28 pts) Solve the following equations and inequalities. If no solutions or an infinite number of solutions, state so. Remember to check your solutions and to state your answer clearly.

c. $2x + 6 \geq x - 14$. Give the solution set in interval notation

d. $|2x + 3| = 15$

e. $x^2 + 6 = -5x$. Solve by factoring.

f. $t^2 + 6t - 7 = 0$. Solve by completing the square.

g. $x^2 + 6 = -5x$ using the quadratic formula (do not check)

h. $\dfrac{4}{t-3} + \dfrac{2}{t-3} = \dfrac{12}{t^2 - 6t + 9}$

i. $x = \sqrt{x+7} + 5$

j. $3^x = 7$ (give the answer to the nearest hundredth)

k. $\log_7(x+1) + \log_7(x-1) = \log_7 8$