MATH 120
SPRING 2022 NAME:
EXAM 4

1. [10 pts.] Suppose you have \$6000 to invest. Which investment yields the greater return over 4 years: 0.88% compounded quarterly or 0.84% compounded continuously? Round the final value of each investment to the nearest penny. Needed formulas: $A = P(1 + r/n)^{nt}$, $A = Pe^{rt}$.

2. [5 pts. each] Find the domain of each in interval notation.
   (a) $f(x) = \log(x + 14)$
   (b) $f(x) = \ln(x^2 - 4x - 12)$

3. [10 pts.] Write as a single logarithm with coefficient 1:

$$\tfrac{1}{3}(\log_4 x - \log_4 y) + 2\log_4(x + 1)$$

4. [10 pts.] Given $A = \log_b 2$ and $C = \log_b 3$, express $\log_b \sqrt{9/16}$ in terms of $A$ and $C$.

5. [10 pts. each] Solve each equation exactly. Where necessary, also give a decimal approximation of a solution that is correct to two decimal places.
   (a) $5^{2-x} = \frac{1}{125}$
   (b) $e^{2x} - 2e^x - 3 = 0$
   (c) $\log_8(1 - 3x) = 2$
   (d) $2\log_3(x + 4) = \log_3 9 + 2$

6. [10 pts.] The half-life of thorium-229 is 7340 years. How long will it take for a sample of this isotope to decay to 18% of its original amount?

7. [10 pts.] Solve the system by the substitution or addition method:

$$\begin{cases} 2x - 7y = 2 \\ 3x + y = -20 \end{cases}$$

8. [15 pts.] The sum of three times a first number and twice a second number is 8. If the second number is subtracted from twice the first number, the result is 3. Set up a system of equations and solve to find the numbers.

9. [10 pts.] Solve the system:

$$\begin{cases} 2x - y + z = 1 \\ 3x - 3y + 4z = 5 \\ 4x - 2y + 3z = 4 \end{cases}$$

10. [10 pts.] Solve the nonlinear system:

$$\begin{cases} y^2 - x = 4 \\ x^2 + y^2 = 4 \end{cases}$$

11. [15 pts.] At a 30th anniversary screening of *Star Trek VI: The Undiscovered Country*, 400 tickets were sold. The ticket prices were \$8, \$10, and \$12, and the total income from ticket sales was \$3700. How many tickets of each type were sold if the combined number of \$8 and \$10 tickets sold was 7 times the number of \$12 tickets sold?