MATH 120
FALL 2023 NAME:
EXAM 4

1. [10 pts. each] Find the domain of each in interval notation.
   (a) $f(x) = \ln(4 - 7x)$
   (b) $f(x) = \log_2\left(\dfrac{x+3}{x^2-9}\right)$

2. [10 pts.] Condense the logarithmic expression, writing a single logarithm with coefficient 1 and simplifying where possible:

$$\log x + \log(x^2 - 1) - \log 7 - \log(x + 1)$$

3. [10 pts. each] Solve each equation exactly. No rounded decimal answers!
   (a) $8^{1-2x} = 64^{x-4}$
   (b) $e^{2x} - 3e^x + 2 = 0$
   (c) $2 - \ln(3 - x) = 0$
   (d) $\log_9(x - 5) + \log_9(x + 3) = 1$

4. [10 pts.] The half-life of strontium-90 is 25 years. How long will it take a 50 mg sample to decay to a mass of 32 mg? Round to the nearest tenth of a year.

5. [10 pts.] A wooden artifact from an ancient tomb contains 71% of the carbon-14 that is present in living trees. How long ago was the artifact made, given that the half-life of carbon-14 is 5730 years?

6. [10 pts.] Solve the system by the substitution or addition method:

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

7. [10 pts.] Solve the system:

$$\begin{cases} x + y + 6z = 3 \\ x + y + 3z = 3 \\ x + 2y + 4z = 7 \end{cases}$$

8. [10 pts.] A clown circus charges \$9 for adults and \$7 for children. On a day when 325 customers patronized the circus, the total receipts were \$2495. How many were adults? How many were children?