

INSTRUCTIONS: SKETCH THE FUNCTIONS. LABEL INTERCEPTS AND ASYMPTOTES.

#1  $f(x) = (5)^x$

#2  $g(x) = \log_{\frac{1}{4}} x$

#3  $h(x) = \left(\frac{2}{3}\right)^x - 2$

#4  $y(x) = \log_3(x + 4)$

INSTRUCTIONS: SOLVE THE EQUATIONS FOR THE UNKNOWN.

#5  $3^{x-1} = 9^{x+2}$

#6  $2e^{-x} = 7$

#7  $\log_6(x^2 - 5x) = 2$

#8  $\ln(x - 1) + \ln 4 = \ln(2x + 4) - \ln 2$

INSTRUCTIONS: READ EACH STATED PROBLEM AND ANSWER THE QUESTION.

#9 A radioactive element decays according to the law  $A(t) = A_0 \cdot 2^{-\left(\frac{t}{200}\right)}$  where  $t$  represents days elapsed. If the amount of polonium left after 600 days is 12 mg, what was the initial amount present?

#10 Carbon-14 decays according to the function  $Q(t) = Q_0 e^{-0.00012t}$  where  $t$  represents years elapsed. A skull from an archeological site has thirty-two percent of the amount of C-14 that it originally contained. Determine the approximate age of the skull.

#11 According to Newton's Law of Cooling, the temperature  $T$  of a liquid  $t$  minutes after it is placed in a cooler environment is given by the model  $T(t) = T_A + (T_0 - T_A)e^{-kt}$ ,  $t > 0$ , where  $T_A$  is the ambient temperature,  $k$  is the cooling rate, and  $T_0$  is the initial temperature of the liquid. A chef heats a soup to 212° F. He then lets it stand for 3 minutes in his kitchen, which has a room temperature of 85° F, before finding that the soup has cooled to 150° F. What is the soup's cooling rate?

#12 Consider problem eleven. If the chef wants to serve the soup to customers at 120° F, how long should he let it stand?