1. Solve the following logarithmic and exponential equations.

(a) \( \log_2(x - 2) + \log_2(x + 2) = 5 \)

(b) \( \log_6(x - 1) + \log_6(x - 2) = 1 \)

(c) \( \log_5 x - \log_5(x - 2) = 3 \)

(d) \( \ln(x) - \ln(x + 1) = \ln(x + 3) - \ln(x + 5) \)

(e) \( \log_x(16) = 4 \)

(f) \( e^{x+1} = 10^x \)

(g) \( 5^{x+3} = 2^{1-3x} \)

(h) \( 9 = e^{-3x^{2}} \)

(i) \( \log(x^2 - 15) = 1 \)

2. The following questions deal with compounding interest \((A = P(1 + \frac{r}{n})^{nt})\) and continuous compounding interest \((A = Pe^{rt})\). Please round your answers to the nearest whole number.

(a) Suppose you invest $50 at 6\% compounded monthly. How much money is in your account after 3 years? How long will it take to have $1,000 in the account?

(b) Suppose you invest $50 at 6\% compounded continuously. How much money is in your account after 3 years? How long will it take to have $1,000 in the account?

(c) Suppose you invest $1,000 at 4\% compounded continuously. How long will it take to double your investment?
3. The following questions deal with exponential growth \((k > 0)\) and decay \((k < 0)\) \((A(t) = A_0e^{kt})\).

(a) Iodine 131 is a radioactive material that decays according to the function \(A(t) = A_0e^{-0.087t}\), where \(A_0\) is the initial amount present, \(A\) is the amount present at time \(t\) (in days). Assume a scientist has 100 grams of iodine 131 initially.

i. How much iodine 131 is left after 9 days?

ii. How long until there are 70 grams left?

iii. What is the half life of iodine 131?

(b) Carbon-14 decays approximately according to the function \(A = A_0e^{-0.0001218t}\). Here \(t\) is in years, and \(A_0\) is the amount of carbon-14 present in a living sample, and \(A\) is the amount remaining after \(t\) years.

i. How long does it take a 14 gram sample to decay to 10 grams?

ii. What is the half life of carbon-14?

iii. Suppose you find a fossil with 35% the amount of carbon 14 found in a living specimen. Approximately how old is the fossil?

4. Determine the distance and midpoint between the following points.

(a) \((-2, 1)\) and \((4, 3)\)

(b) \((-4, -5)\) and \((1, -1)\)

(c) \((7, 0)\) and \((-7, 0)\)

5. Write the standard form of the equation and the general form of the equation of the circle with center \((h, k)\) and radius \(r\).

(a) \(r = 3, (h, k) = (3, -1)\)

(b) \(r = \sqrt{5}, (h, k) = (0, 2)\)

6. Find the center, radius, and intercepts of each circle.

(a) \(x^2 + (y - 1)^2 = 1\)

(b) \(3(x + 2)^2 + 3(y - 1)^2 = 18\)

(c) \(2x^2 + 2y^2 - 8x + 7y - 10 = 0\)

(d) The circle with endpoints of a diameter at \((3, 4)\) and \((-1, 2)\).