Problem 1 Let $y = -3x^2 + 6x + 2$. Write it in the standard form and sketch the graph.

Problem 2 Solve the equation $6x^3 + 19x^2 + 2x - 3 = 0$.

Problem 3 Let $f(x) = 5(x + 1)(x - 2)^2$. Sketch the graph and indicate the $y$-intercept.

Problem 4 Let $f(x) = \frac{x^2 - x - 2}{x + 2}$.

a. Find the vertical asymptote.
b. Find the horizontal/slant asymptote if there is any.

c. Find $x$-intercept and $y$-intercept.

d. Sketch the graph.

**Problem 5** Let $f(x) = x^5 + 1$ and $g(x) = \sqrt[3]{x - 1}$. Verify that they are inverse functions of each other by using composite of functions.

**Problem 6** Let $y = \frac{5}{3} - \frac{2x}{3}$. Find its inverse function.
**Problem 7** Sketch the graph of \( y = e^{2x} \) and \( y = e^{-2x} \). Indicate the \( y \)-intercept.

**Problem 8** Sketch the graph of \( y = \ln(x - 5) \) and find the domain.

**Problem 9** A sample of 500 grams of radioactive lead 210 decay to polonium 210 according to the function defined by \( A(t) = 500e^{-0.032t} \) where \( t \) is time in years. Find the half-life. Leave your answer as an expression. (Half-life: the amount of time which it takes for a quantity to become half of its initial amount).

**Problem 10** Solve the following equations.

a. \( e^x = -10 \)
b. $\log x - \log(x - 1) = 1$

c. $2 \ln x + \ln 5 = \ln 20.$

d. $3^{x+2} = \left(\frac{1}{27}\right)^{2x-1}.$