Please, write careful, complete solutions for the following problems and submit them according to the Directions for Submitting Written Assignments (check in Canvas for links to instruction pages). **Read he questions carefully, including possible footnotes, that are part of the question too.** I am expecting that you will use the methods from the class, not so much the answer (bare answers with no work shown do not count). When solving an abstract mathematical problem do not use decimal approximations, **but work with and provide answers as exact expressions**, for example exact fractions, and not decimal forms (as in \( \frac{1}{3} \), not 0.333 ), and never, ever, use “mixed numbers” (write \( \frac{2}{3} \), not \( 2 \frac{1}{3} \)). Do not simply rely on your calculator or graphing program to answer these questions. Remember that graphs have to be drawn by hand, not printed out from a graphing computer program. Note also that the focus of this set of problems is on functions, and in particular linear functions. **All questions should be addressed by writing out appropriate functions, and using them to solve the problem** (for example, do not use a table of values to find answers, but write an equation using appropriate functions, and solve it).

**Part I. Review**

1

Find the equation of the line that contains the points \((2, -3)\) and \((-2, 4)\). Express your final answer in “slope-intercept” form (that is, in the form \(y = mx + b\))

2

Find the equation of the line that is perpendicular to the line you found in problem 1, and contains the point \((1, 2)\). Express your final answer in “slope-intercept” form (that is, in the form \(y = mx + b\))

3

Solve the system

\[
\begin{align*}
2x - 3y & = 1 \\
\frac{y}{2} - 3x & = -1
\end{align*}
\]

using either the substitution or the elimination method. Express the solution as an ordered pair.
Part II. Polynomials

Note Your answers to the following questions should be in the form of a polynomial in standard form, that is in descending order of powers, with each power appearing only once. For example, \( x^3 - 2x^2 + 4x - 5 \) is in standard form, while \( 4x - 2x^2 - 5 + x^3 \) and \( x^3 + x^2 - 3x^2 + x + 3x - 5 \), even though they represent the same polynomial, are not in standard form.

4

Calculate the result, and simplify the following operation

\[
(3x^3 - x^2 + 3) - (3x^4 - 2x^3 + 2x^2 - x - 2)
\]

Show in detail how you went through each step.

5

Calculate the result, and simplify the following operation

\[
\left( x^2 - \frac{x}{3} + 2 \right) \cdot \left( \frac{x^2}{3} - x - 3 \right)
\]

Show in detail how you went through each step. Do not use decimals or “mixed numbers” in your answer.

6

Use the graph (in the next page)\(^1\) of the functions \( f \) and \( g \) to answer the following questions– do not try to find an algebraic expression for the curves and even if you do, do not use that to answer point 2: that would be a “no answer”.

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\(^1\) If you are unsure of the meaning of open and closed circles and arrows at the tips of the graph curves, please check out the book or any other resource, as these are very common symbols.
1. State the domain and range of \( f \) and \( g \) as inequalities (you may need to approximate some data)\(^2\)

2. Use the graph to solve the equation \( f(x) = g(x) \) (in other words, determine the value(s) of \( x \), such that \( f(x) = g(x) \)). We are only looking for the values of the independent variable \( x \) – do not answer with an ordered pair, because that’s not what the question is asking.

\(^2\) Recall that the domain of a function is the set of numbers that can be used as input with the resulting operations making sense, while the range is the set of all possible outputs. If necessary, make sure you check the meaning of these important concepts in the book and in the additional materials.