Pre-Calculus 12 Enriched
Polynomial Functions & Equations Extension

1.) A quadratic function is of the form $f(x) = x^2 + bx + c$. The roots of the equation $f(x) = 0$ are 1 and *k*. If $f(2) = 5$, determine the value of *k*.

2.) The parabola $y = x^2 - 2x + 4$ is translated *p* units to the right and *q* units down. The *x* - intercepts of the resulting parabola are 3 and 5. Determine the values of *p* and *q*.

3a.) For the quadratic equation $ax^2 + bx + c = 0$, where $a \neq 0$, show that the sum of the roots is $-\frac{b}{a}$ and the product of the roots is $\frac{c}{a}$.

b.) The roots of $x^2 + cx + d = 0$ are *a* and *b*.
The roots of $x^2 + ax + b = 0$ are c and d. If *a*, *b*, *c*, and *d* are all non-zero, determine the value of $a + b + c + d$.

4.) Prove that the line with equation $y = 2x - 1$ does not intersect the curve with equation $y = x^4 + 3x^2 + 2x$.

5.) Identify the degree of the polynomial and find the value of $f(x)$ that satisfies the following:
a.) $f(x) - f(x-1) = 4$ with $f(0) = 4$
b.) $f(x) - 2f(x-1) + f(x-2) = 6$ with $f(1) = 6, f(0) = 1$

6.) Suppose that m and n are real numbers for which the three (not necessarily distinct) roots of $x^3 - mx^2 + nx - 1 = 0$ are *m*, *n*, and 1. Determine the value of $m + n + 1$.

7.) Determine all values of *x* that solve the equation.

$$(x^2 - 3x + 1)^2 - 3(x^2 - 3x + 1) + 1 = x$$

8.) The remainder when $f(x) = x^5 - 2x^4 + ax^3 - x^2 + bx - 2$ is divided by $x + 1$ is –7. When $f(x)$ is divided by $x - 2$, the remainder is 32. Determine the remainder when $f(x)$ is divided by $x - 1$.