

NCLS Math Program Evaluation Test for Algebra 2B

Name: _____

Grade: _____

Are You Ready for Algebra 2B?

If you have mastered working with quadratics, polynomials division and roots, sequences and series as illustrated in the problems below, you are ready for this class.

1. **Polynomial Divisions.** Find the quotient and remainder in each of the following divisions
a - c:

(a) $9x^4 + x^3 - 12x + 21$ divided by $x + 4$

(b) $3r^4 + 16r^3 - 5r + 19$ divided by $3r - 2$

(c) $t^4 - t^2 + 3t - 7$ divided by $t^2 - 3t + 8$

(d) If $x^4 + 4x^3 + 6px^2 + 4qx + r$ is exactly divisible by $x^3 + 3x^2 + 9x + 3$, then find $(p + q)r$.

2. **Maxima and Minima of Quadratics**

(a) Let $f(x) = x^2 + 6x + 5$, find the smallest possible value of $f(x)$ if x is a real number.

(b) Let $f(x) = ax^2 + bx + c$, where a, b, c are real numbers and $a > 0$. In terms of a, b , and/or c , find the real value of x that makes $f(x)$ as small as possible. What happens if a is negative?

3. **Polynomial Roots**

(a) For what value(s) of k is $x - 2$ a factor of $x^3 + 2kx^2 + k^2x + k - 4$?

(b) Let $f(x) = x^2 + 4x$. For what values of x is $f(f(x)) = f(x)$?

(c) Solve $2x^3 + 35 = -19x^2 - 52x$

(d) Find the roots of $f(r) = 2r^3 + 7r^2 - 4r - 21$

(e) Find the zeros of $g(s) = s^3 + 8s + 24$

4. **Factoring Multivariable Polynomials**

(a) Factor $f(a, b) = b^3 - ab^2 - ab - b + a^2 + a$.

(b) Factor $f(a, b, c) = (a + b + c)^3 - a^3 - b^3 - c^3$

(c) Factor $a^2(b - c) + b^2(c - a) + c^2(a - b)$

(d) Given $x + \frac{1}{x} = 1$, calculate $x^7 + \frac{1}{x^7}$

NCLS Math Program Evaluation Test for Algebra 2B

5. Sequences and Series

- (a) Find all ordered pairs (x, y) such that $3, x, y$ is a geometric sequence and $x, y, 9$ is an arithmetic sequence.
- (b) Prove that for any linear function $f(x)$, the sequence $f(0), f(1), f(2), f(3), \dots$ is an arithmetic sequence.
- (c) In an arithmetic sequence, the p^{th} term is q and q^{th} term is p , where $p \neq q$. Find the $(p + q)^{\text{th}}$ term.
- (d) Find the sum of the series $1 + \frac{1}{2} + \frac{1}{10} + \frac{1}{20} + \frac{1}{100} + \dots$, where we alternately multiply by $\frac{1}{2}$ and $\frac{1}{5}$ to get successive terms.
- (e) Calculate $-3 + 6 - 12 + 24 - \dots - 768$
- (f) Consider the ten numbers $ar, ar^2, ar^3, \dots, ar^{10}$. If their sum is 18 and the sum of their reciprocals is 6, determine their product.
- (g) Evaluate $\sum_{i=1}^4 \sum_{j=1}^4 (i - j)^2$
- (h) Evaluate $\sum_{j=0}^5 \sum_{k=0}^j 3$
- (i) Evaluate $\prod_{n=1}^9 \frac{n}{n+1}$