Name: ____

Polynomials and Synthetic Division

1) Using the remainder theorem, find the remainder of the following divisions and then check your answers by long division.

   1) $(4x^3 - x^2 + 2x + 1) \div (x - 5)$
   2) $(3x^2 + 12x + 1) \div (x - 1)$

2) Find the quotient and remainder of the following divisions

   1) $(x^3 - x^2 + 8x - 5) \div (x^2 - 7)$
   2) $(x^3 - 5x^2 + 15) \div (x + 3)$
   3) $(2x^3 - 6x^2 - x + 6) \div (x - 6)$
   4) $(x^4 + 3x^3 - x^2 - 2x - 7) \div (x^2 + 3x + 1)$

3) Using long division, find the remainder when $6x^3 + 5x^2 - 8x + 1$ is divided by $(2x - 1)$. Check that your answer is correct by using the Remainder Theorem.

4) Verify that the numbers given alongside of the cubic polynomials below are their zeroes.

   (1) $2x^3 + x^2 - 5x + 2$ — ½ , 1, – 2

   (2) $x^3 - 4x^2 + 5x - 2$ — 2, 1, 1

5) On dividing $x^3 - 3x^2 + x + 2$ by a polynomial $g(x)$, the quotient and remainder were $x - 2$ and $-2x + 4$, respectively. Find $g(x)$.

6) Verify that 3, –1,- 1/3 are the zeroes of the cubic polynomial $p(x) = 3x^3 - 5x^2 - 11x - 3$, and then verify the relationship between the zeroes and the coefficients.

7) If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find k and a.

8) Show by using long division that $(3x - 2)$ is a factor of $12x^3 + 4x^2 - 17x + 6$.
Show also that this is true by using the Factor Theorem.

9) Given that $(x - 3)$ is a factor of $f(x) = 5x^3 + ax^2 + bx - 6$, and that the remainder when $f(x)$ is divided by $(x + 2)$ is -40, find a and b, and the other two factors.

10) Given that x-2 is a factor of the polynomial $x^3 - kx^2 - 24x + 28$, find k and the roots of this polynomial

11) Obtain all other zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$

12) Find all the zeroes of $2x^4 - 3x^3 - 3x^2 + 6x - 2$, if you know that two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.