Seventeen generic formulas that may generate prime-producing quadratic polynomials

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Abstract. In one of my previous papers I listed forty-two quadratic polynomials which generate more than twenty-three primes in a row, from which ten were already known from the articles available on Internet and thirty-two were discovered by me. In this paper I list few generic formulas which may conduct to find such prime-producing quadratic polynomials.

I.

The formula 8*n^2 + (2*p + 2)*n + p, where p is prime.

Examples:

: for p = 43 we have the polynomial 8*n^2 + 88*n + 43 which generates 26 distinct primes for values of n from 0 to 25; also, for m = n – 39 is obtained the root prime-generating polynomial 8*m^2 – 488*m + 7243 which generates, from values of m from 0 to 30, thirty-one distinct primes in a row;
: for p = 29 we have the polynomial 8*n^2 + 60*n + 29 which generates 20 distinct primes or squares of primes for values of n from 0 to 19;
: for p = 19 we have the polynomial 8*n^2 + 40*n + 19 which generates 20 distinct primes for values of m from 0 to 19, where m = n – 12, in other words from this polynomial is obtained the root prime-generating polynomial 8*m^2 – 152*m + 691.

II.

The formula 2*m^2*n^2 + 40*m*n + 1, where m is positive integer.

Examples:

: for m = 1 we have the polynomial 2*n^2 + 40*n + 1 which generates 36 distinct primes or squares of primes for values of n from 0 to 35; also, for m = 6*n + 1, is obtained the polynomial 72*m^2 + 264*m + 43 which generates 9 distinct primes in a row; for m = 7*n + 5 is obtained the polynomial 98*m^2 + 420*m + 251 which generates 14 distinct primes in a row; for m = 8*n + 6 is obtained the polynomial 128*m^2 + 512*m + 313 which generates 13 distinct primes or squares of primes in a row;

: for m = 8 we have the polynomial 128*n^2 + 320*n + 1 which generates 17 distinct primes in a row for values of n from 0 to 16.

III.

The formula 2*m^2*n^2 - 199, where m is positive integer.

Examples:

: for m = 1 we have the polynomial 2*n^2 - 199 which generates 28 distinct primes in a row for values of n from 0 to 27; also, for m = 2*n + 29, is obtained the polynomial 8*m^2 + 232*m + 1483 which generates 31 distict primes respectively 62 redundant primes in a row; also, for m = 2*n – 1, is obtained the polynomial 8*m^2 - 8*m - 197 which generates 31 distict primes in a row;

: for m = 2 we have the polynomial 8*n^2 - 199 which generates 14 distinct primes in a row; also, for m = n – 13 we have the polynomial 8*m^2 – 208*m + 1153 which generates 31 distinct primes and 44 redundant primes in a row;

: for m = 3 we have the polynomial 18*n^2 - 199 which generates 18 distinct primes in a row;

: for m = 4 we have the polynomial 32*n^2 - 199 which generates 27 distinct primes or squares of primes in a row.

IV.

The formula 2*m^2*n^2 + 29, where m is positive integer.

Examples:

: for m = 1 we have the Sierpinski’s polynomial 2*n^2 + 29 which generates 29 distinct primes in a row;

: for m = 2 we have the polynomial 8*n^2 + 29 which generates 15 distinct primes in a row.

V.

The formula m^2*n^2 + m*n + 41, where m is positive integer.

Examples:

: for m = 1 we have the Euler’s polynomial n^2 + n + 41 which generates 40 distinct primes in a row;
: for m = 2 we have the polynomial 4*n^2 + 2*n + 41 which generates 20 distinct primes in a row; also, for m = 2*n + 1 is obtained the polynomial 16*m^2 + 20*m + 47 which generates 20 distinct primes in a row; also for t = t – 10 we have the polynomial 16*t^2 – 300*t + 1447 which generates 31 primes in a row;
: for m = 3 we have the polynomial 9*n^2 + 3*n + 41 which generates 27 distinct primes in a row; also, for m = n – 13 is obtained the polynomoal 9*n^2 – 231*n + 1523 which generates 40 distinct primes in a row.

VI.

The formula m^2*n^2 + 2*m*n + 59, where m is positive integer.

Examples:

: for m = 2 we have the polynomial 4*n^2 + 4*n + 59 which generates 14 distinct primes in a row;
: for m = 6 we have the polynomial 36*n^2 + 12*n + 59 which generates 15 distinct primes in a row; also for m = n – 4 is obtained the polynomial 36*m^2 – 276*m + 587 which generates 19 distinct primes in a ro;
: for m = 12 we have the polynomial 144*n^2 + 24*n + 59 which generates 12 distinct primes in a row; also for m = n – 7 is obtained a polynomial which generates 19 distinct primes in a row.

VII.

The formula 8*m^2*n^2 + 60*m*n + 29, where m is positive integer.

Examples:

: for m = 1 we have the polynomial 8*n^2 + 60*n + 29 which generates 20 distinct primes or squares of primes in a row; also for m = n – 17 is obtained the polynomial 8*m^2 – 212*m + 1321 which generates 22 distinct primes restpectively 37 primes or squares of primes in a row.

VIII.

The formula 11*n^2 + (2*p – 13)*n + p, where p is prime.

Examples:

: for p = 11 we have the polynomial 11*n^2 + 9*n + 11 which generates 11 distinct primes in a row; also for m = n – 10 is obtained the polynomial 11*m^2 – 211*m + 1021 which generates 21 distinct primes in a row;
: for p = 13 we have the polynomial 11*n^2 + 13*n + 13 which generates 10 distinct primes in a row; also for m = n – 11 is obtained the polynomial 11*m^2 – 427*m + 4153 which generates 21 distinct primes in a row.

IX.

The formula 8*n^2 - (2*p – 2)*n - p, where p is prime.

Examples:

: for p = 13 we have the polynomial 8*n^2 - 24*n - 13 which generates 10 distinct primes in a row;
: for p = 37 we have the polynomial 8*n^2 - 72*n - 37 which generates also many primes in a row.

X.

The formula m^2*n^2 – 57*m*n + 853, where m is positive integer.

Examples:

: for m = 1 and t = n – 11 is obtained the polynomial t^2 – 79*t + 1601 which generates 40 distinct primes in a row (the same primes generated by Euler’s polynomial in reversed order);
: for m = 2 and t = n – 5 is obtained the polynomial 4*t^2 – 154*t + 1523 which generates 40 distinct primes in a row;
: for m = 3 and t = n – 3 is obtained the polynomial 9*t^2 – 225*t + 1447 which also generates many distinct primes in a row;

: for m = 4 and t = n – 2 is obtained the polynomial 16*t^2 – 292*t + 1373 which generates 31 distinct primes in a row;
: for m = 5 and t = n – 18 is obtained the polynomial 25*t^2 – 1185*t + 14083 which generates 32 distinct primes in a row;
: for m = 9 and t = n – 5 is obtained the polynomial 81*t^2 – 1323*t + 5443 which generates 28 distinct primes in a row.

XI.

The formula m^2*n^2 – 69*m*n + 1231, where m is positive integer.

Examples:

: for m = 2 and t = n - 2 is obtained the polynomial 4*t^2 – 154*t + 1523 which generates many primes in a row;
: for m = 3 and t = n - 1 is obtained the polynomial 9*t^2 – 225*t + 1447 which generates many primes in a row;
: for m = 4 and t = n - 12 is obtained the polynomial 16*t^2 – 628*t + 6203 which generates 30 distinct primes in a row;
: for m = 9 and t = n - 15 is obtained the polynomial 81*t^2 – 3051*t + 28771 which generates 28 distinct primes in a row.

XII.

The formula m^2*n^2 – 149*m*n + 5591, where m is positive integer.

XIII.

The formula m^2*n^2 – 157*m*n + 6203, where m is positive integer.

XIV.

The formula m^2*n^2 – 77*m*n + 1523, where m is positive integer.

XV.

The formula 2*m^2*n^2 – 60*m*n + 251, where m is positive integer.

XVI.

The formula 2*m^2*n^2 – 140*m*n + 2251, where m is positive integer.

XVII.

The formula 2*(m*n + m + 1)^2 - 199, where m is positive integer.

Examples:

: for m = 1 is obtained the polynomial 2*n^2 + 8*n - 191 which generates 26 distinct primes in a row;
: for m = 2 is obtained the polynomial 8*n^2 + 24*n - 181 which generates 30 distinct primes in a row;
: for m = 4 and t = n – 6 is obtained the polynomial 32*n^2 - 944*n + 6763 which generates 31 distinct primes in a row.

Note:

In this paper I considered to be primes the number 1 and the negative integers which are primes in absolute value.