2.4 Real Zeroes of Polynomial Functions

Target 2C: Find Real and Complex Zeroes of Polynomials by Synthetic and Long Division

Review of Prior Concepts

1. Write the factored form of the polynomial function that crosses the *x*-axis @ $x = 3$ and $x = -2$ and touches the *x*-axis @ $x = 1$ with a degree of 6.

2. Write the factored form of the polynomial function: $f(x) = x^3 - 4x$

3. Perform long division to find the remainder of: $1272 \div 7$

More Practice

Factored form of Polynomials

https://www.youtube.com/watch?v=PmBNhKRhpqE

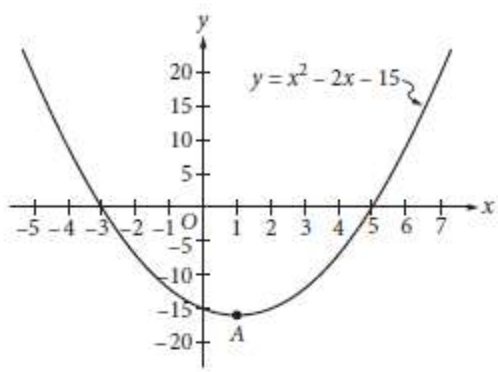
http://www.mathplanet.com/education/algebra-1/factoring-and-polynomials/polynomial-equations-in-factored-form

SAT Connection

Passport to Advanced Mathematics

11. Understand the relationship between zeros and factors of polynomials.

Example:

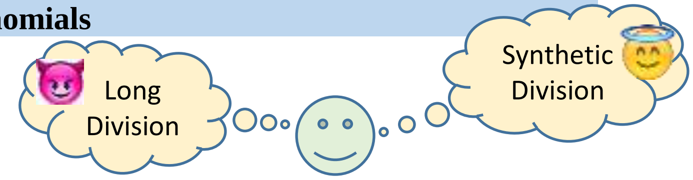


A) $y = (x + 3)(x - 5)$
B) $y = (x - 3)(x + 5)$
C) $y = x(x - 2) - 15$
D) $y = (x - 1)^2 - 16$

Which of the following is an equivalent form of the equation of the graph shown in the *xy*-plane above, from which the coordinates of vertex A can be identified as constants in the equation?

Solution

Dividing Polynomials



Divide $f(x) = x^3 + 4x^2 + 7x - 9$ by $d(x) = x + 3$

<u>Long Division</u>

<u>Synthetic Division</u>

- Set divisor equal to zero & solve for *x*.
- Write coefficients of dividend
  (use 0 for any missing term)

Example: Divide $f(x) = x^3 + 3x - 4$ by $g(x) = x - 2$

Remainder Theorem

If a polynomial $f(x)$ is divided by $x-k$, then $f(k)$ = remainder.

Example:
Find the remainder when $f(x)=x^3+3x-4$ is divided by $g(x)=x-2$

To determine if $x-k$ is a factor of a polynomial $f(x)$, use one either:

① Synthetic Division
② Remainder Theorem

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Example:
Does $f(x)=x^3-5x^2-18x+72$ have the factor $g(x)=x-3$?

<u>Remainder Theorem</u>	<u>Synthetic Division</u>

Example:
Find two factors of $f(x)=3x^4-2x^3-9x^2+4$ using the graphing calculator and find the other factors using synthetic division.

More Practice

Real Zeros of Polynomials
http://www.coolmath.com/algebra/22-graphing-polynomials/05-real-zeros-03
https://people.richland.edu/james/lecture/m116/polynomials/zeros.html
Synthetic Division
http://mathbitsnotebook.com/Algebra2/Polynomials/POPolySynDivide.html
http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut37_syndiv.htm
http://www.mesacc.edu/~scotz47781/mat120/notes/divide_poly/synthetic/synthetic_division.html
https://www.youtube.com/watch?v=1byR9UEQJN0
Remainder Theorem & Factor Theorem
https://www.mathsisfun.com/algebra/polynomials-remainder-factor.html
http://mathbitsnotebook.com/Algebra2/Polynomials/PORemainderTh.html
https://www.youtube.com/watch?v=_IPqCaspZOs

Homework Assignment

p.216 #1,7,9,10,15,17,22,25,26,27

SAT Connection

Solution

Choice D is correct. Any quadratic function q can be written in the form $q(x) = a(x - h)^2 + k$, where a, h, and k are constants and (h, k) is the vertex of the parabola when q is graphed in the coordinate plane. (Depending on the sign of a, the constant k must be the minimum or maximum value of q, and h is the value of x for which $a(x - h)^2 = 0$ and $q(x)$ has value k.) This form can be reached by completing the square in the expression that defines q. The given equation is $y = x^2 - 2x - 15$, and since the coefficient of x is -2, the equation can be written in terms of $(x - 1)^2 = x^2 - 2x + 1$ as follows: $y = x^2 - 2x - 15 = (x^2 - 2x + 1) - 16 = (x - 1)^2 - 16$. From this form of the equation, the coefficients of the vertex can be read as $(1, -16)$

Choices A and C are incorrect because the coordinates of the vertex A do not appear as constants in these equations. Choice B is incorrect because it is not equivalent to the given equation.