

Assignment 2D – The Fun. Theorem of Algebra

After completing lesson 3C, complete the assignment below.

Simplify the following expressions.

1. $(3i)^2$

2. $(2 + 3i)(1 - 4i)$

3. $(x + i)(x - i)$

4. $(x - \sqrt{3}i)(x + \sqrt{3}i)$

5. $(a + bi)(a - bi)$

6. Complex conjugates are two complex numbers of the form $a + bi$ and $a - bi$.
What happens everytime you multiply two complex conjugates (as in problems 3-5)?

7. Consider a polynomial $f(x) = x^4 + x^3 - 4x^2 + 2x - 12$ that can be written with a linear factorization of the form $f(x) = (x - a)(x - b)(x - c)(x - d)$.

If two of these factor contain complex numbers, explain why do we know that two of the terms must be complex conjugates? (Hint: Consider your answer to #6)

8. The polynomial $f(x) = x^4 + x^3 - 4x^2 + 2x - 12$ has zeros at $x = -3$ and $x = 2$.
- Find a real factorization of $f(x)$.

b. Find the complex zeros of $f(x)$.

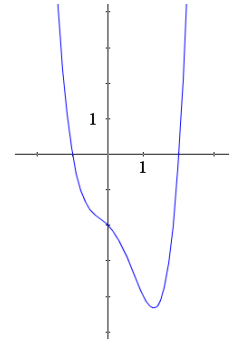
c. Write the linear factorization (with real and complex factors) of $f(x)$.

9. State the *Fundamental Theorem of Algebra*.

10. Consider the quartic (4th degree) function graphed to the right.

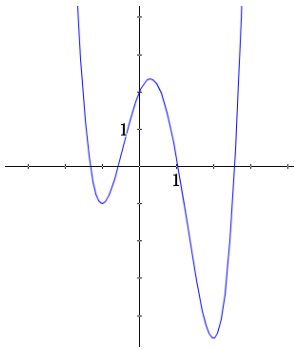
a. How many real zeros does the function have? Explain.

b. Does the function have any complex zeros? If so, how many? Explain how you know.

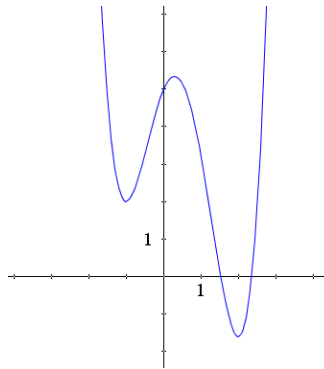


11. For each quartic function below, state how many real zeros (including repeated zeros) and how many imaginary zeros it has.

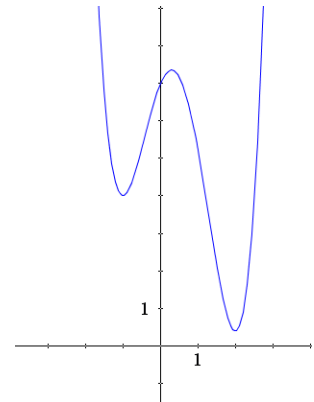
a)



b)



c)



Completely factor the polynomials. You may use your calculator (to start), synthetic division, factoring, or the quadratic formula. Leave answers as exact answers in simplified form.

12. $x^4 + 2x^3 + x^2 + 8x - 12$

13. $x^4 - 2x^3 - 6x^2 - 7x - 4$



Pre-Calculus

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Date: _____

Period: _____

Solve the equations. You may use your calculator (to start), synthetic division, factoring, or the quadratic formula. Leave answers as exact answers in simplified form.

14. $2x^4 + 7x^3 - 4x^2 - x - 4 = 0$

15. $4x^5 - 16x^4 + 7x^3 = -12x^2 - 3x - 18$