Unit 5: Quadratics Pre-Unit

Guided Notes

KEY

Name

Period

If found, please return to Mrs. Brandley's room, M-8.

Concept 1: Zero Product Property

Linear Factor: A factor whose highest power of the variable is 1.

Zero Product Property: If a × b = 0 then a = 0 or b = 0 (or both a=0 and b=0).

What is the solution to the product of any number and zero? 0

1. $4 \times 0 =$ 0

2. $4 \times 5 \times 2 \times 3 \times 0 =$ 0

3. $0 \times (x - 5) =$ 0

What x-values would make the following functions equal to 0?

4. $f(x) = x$

X=0

5. $f(x) = x^2$

X=0
(Mult: 2)

6. $f(x) = x - 3$

X=3

7. $f(x) = (x + 1)(x - 7)$

X=-1, 7

8. $f(x) = x(x + 6)(x - 4)$

X=0, -6, 4

9. $f(x) = 2(x + 2)(x + 9)$

X=-2, -9

10. $f(x) = 3x(x - 1)$

X=0 X=1

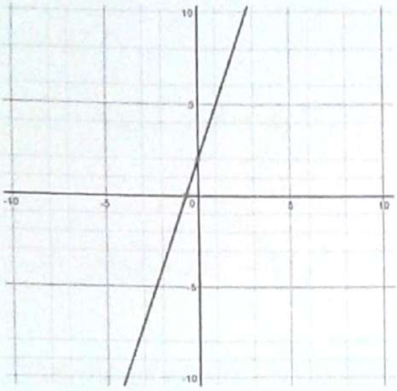
Please keep the following in mind:

- Solving functions is much easier in factored form than in standard form because it is clearer what x-value(s) make(s) the function equal 0.
- Regardless of the number of linear factors that may exist, the process of solving stays the same.
- If x is not adding or subtracting something in its' linear factor, it may still be solved by setting it equal to zero.
- Any constant number never equals zero and thus is NOT a solution to the function.

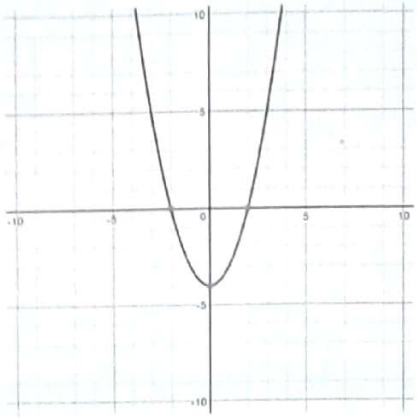
Concept 2: Fundamental Theorem of Algebra

Fundamental Theorem of Algebra: Any polynomial of degree n has n roots……but we may need to use complex numbers.☺

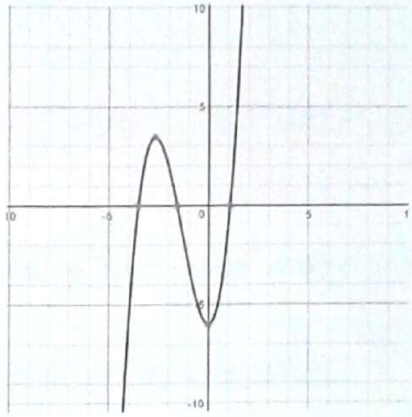
1. $f(x) = 3x + 2$ 1



2. $f(x) = x^2 - 4$ 2

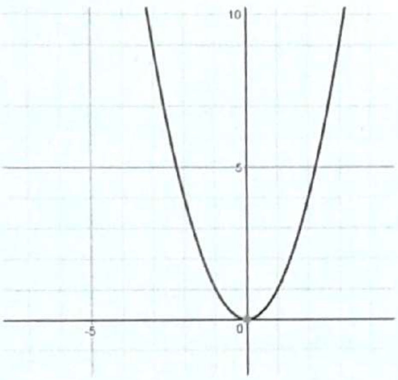


3. $f(x) = x^3 + 4x^2 - 6$ 3

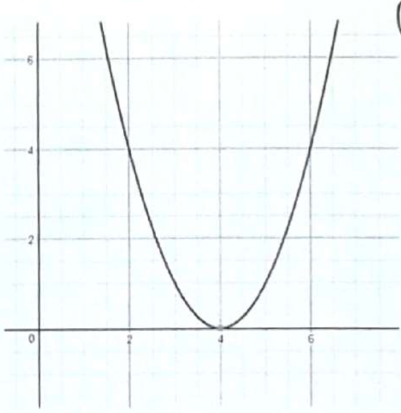


Repeated Roots Exception

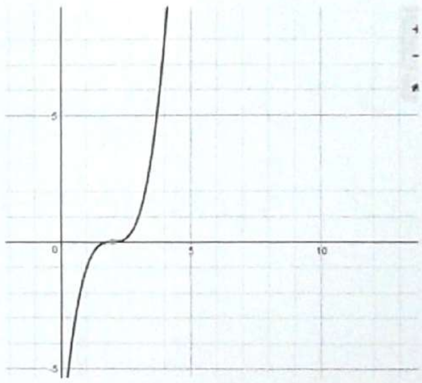
4. $f(x) = x^2$ 2 (Mult)



5. $f(x) = (x - 4)^2$ 2 (Mult)

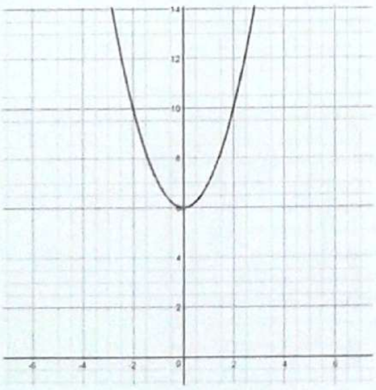


6. $f(x) = (x - 2)^3$ 3(Mult)

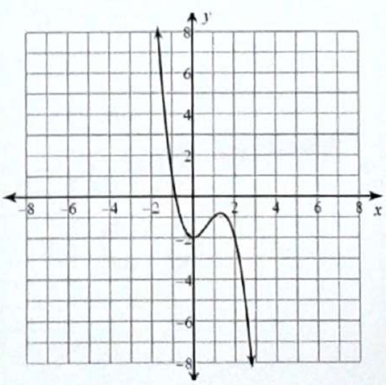


Imaginary Roots Exception

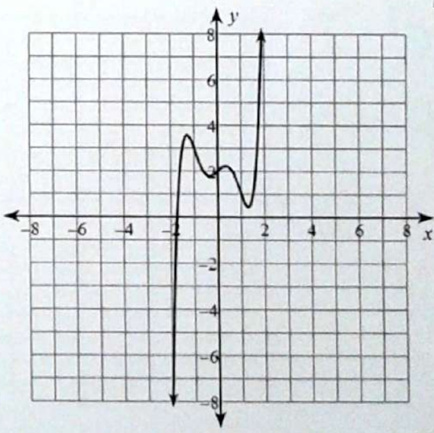
7. $f(x) = x^2 + 6$ 2 I



8. $f(x) = -x^3 + 2x^2 - 2$ 3 I



9) $f(x) = x^5 - 3x^3 + x + 2$ 5 I



How many solutions do the following polynomials have?

1) $f(x) = 2x^2 - 3x^4 + 1$ 4

2) $f(x) = 2x^6 + 3x^4 - 32x^2 - 48$ 6

3) $f(x) = 3x^2 + 3x + 4$ 2

4) $f(x) = 3x^2 - 13x^5 - 10$ 5

5) $f(x) = 3x^2 + 4x^3 + 1$ 3

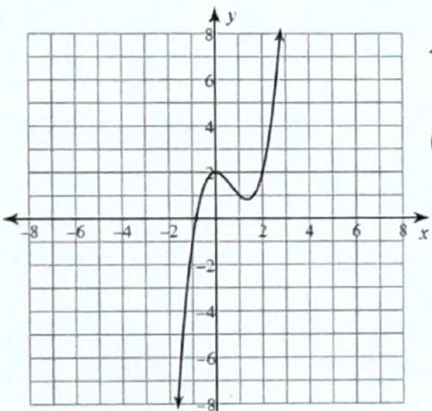
6) $f(x) = 2x^5 + 6x^4 + 27x^7 + 81x^2 + 81x + 243$ 7

7) $f(x) = 2x^4 - 11x^2 + 14$ 4

8) $f(x) = 3x^3 - 6x^4 + 26x^6 - 52x^2 + 48x^5 - 96$ 6

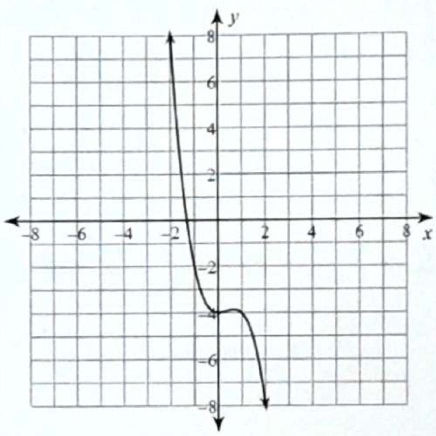
How many solutions do the following functions have? How many are complex and how many are real?

9) $f(x) = x^3 - 2x^2 + 2$



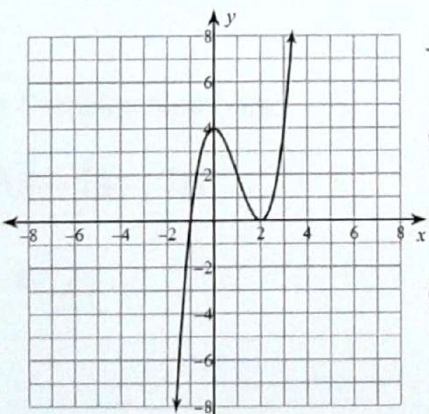
T : 3
C : 2
R : 1

10) $f(x) = -x^3 + x^2 - 4$



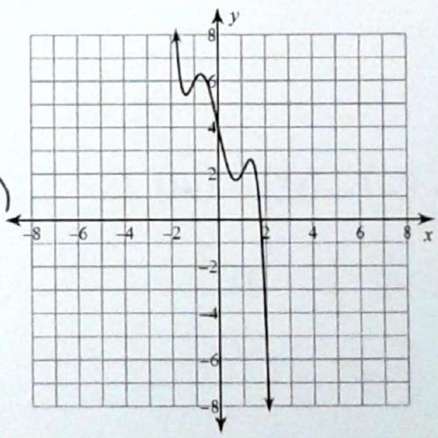
T : 3
C : 2
R : 1

11) $f(x) = x^3 - 3x^2 + 4$



T : 3
R : 3
(one w/ mult)
C : 0

12) $f(x) = -x^5 + 4x^3 - 5x + 4$



T : 5
C : 4
R : 1

Concept 3: Complex Operations

REMINDER: $\sqrt{-1} =$ i $i^2 =$ -1

Adding, Subtracting, and Multiplying Polynomials Review:

$(3x^2 - 3x + 2) + (2x^2 + 5x - 7)$

$5x^2 + 2x - 5$

$(3x^2 - 3x + 2) - (2x^2 + 5x - 7)$

$x^2 - 8x + 9$

$(x - 5)(3x^2 + 4)$

$3x^3 - 15x^2 + 4x - 20$

Order of Operations Review:

P Parentheses (or other grouping symbols)

E Exponents

MD Multiplication & Division from left to right

AS Addition & Subtraction from left to right

Adding Complex Numbers:

1) $(7 + 5i) + (-2 + 8i)$

$5 + 13i$

2) $(3 + i) + (-7 + 2i)$

$-4 + 3i$

Subtracting Complex Numbers:

1) $(1 - 5i) - (4 - 7i)$

$-3 + 2i$

2) $(8i) - (3i) - (-3 - 2i)$

$5i - (-3 - 2i)$

$7i + 3$

$3 + 7i$

Multiplying Complex Numbers:

1) $3(-7i)(-7-3i)$

$-21i(-7-3i)$

$147i+63i^2$

$147i+63(-1)$

$-63+147i$

2) $(3+3i)(-8-7i)$

$-24-21i$

3) $(-4+7i)(-2+8i)$

$+8-32i-14i+56i^2$

$8-46i+56(-1)$

$-48-46i$

4) $(8-2i)^2$

$(8-2i)(8-2i)$

$64-16i-16i+4i^2$

$64-32i+4(-1)$

$60-32i$

5) $(4i)(-4i)(-3-8i)$

$-16i^2(-3-8i)$

$-16(-1)(-3-8i)$

$16(-3-8i$

$-48-128i$

6) $(-1-8i)^2$

$(-1-8i)(-1-8i)$

$1+8i+8i+64i^2$

$1+16i+64(-1)$

$-63+16i$

Let's combine.... ☺

7) $-4+(5+4i)-5$

$+1+4i-5$

$-4+4i$

8) $(-1+2i)-(-3-8i)$

$2+10i$

9) $(2i)(-1+2i)+(i)(3+7i)$

$(-2i+4i^2)+(3i+7i^2)$

$(-2i+(4)(-1))+(3i+7(-1))$

$(-2i-4)+(3i-7)$

$i-13$

$-13+i$

10) $2(4-7i)-(2i)(4i)$

$(8-14i)-(8i^2)$

$(8-14i)-(8(-1))$

$(8-14i)--8$

$16-14i$