Name: _____

Solving Polynomial Equations (Finding Zeros)

1. Try Factoring
    a. Greatest Common Factor
    b. Count Terms
        i. 2 Terms – Special Patterns
            1. Difference of Squares: $a^2 - b^2 = (a - b)(a + b)$
            2. Sum of Cubes: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
            3. Difference of Cubes: $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
        ii. 3 Terms – ( )( )
        iii. 4 Terms – Grouping
    c. Try to factor more
    d. To find zeros, set each factor = 0 and solve (end of problem)
2. *p*'s and *q*'s
    a. List *p* (factors of constant term) and *q* (factors of leading coefficient) and all possible $\frac{p}{q}$
    b. Use a graph to find an *x*-intercept
    c. Use synthetic division with the *x*-intercept to verify that it is a zero
    d. If the depressed polynomial is a quadratic, solve it (end of problem)
        i. Otherwise, repeat step 2b - 2d with the depressed polynomial
    e. Factors are in form $(x - k)$ where *k* is a zero

Factor the Greatest Common Factor, then find the zeros.

1. $3x^2 + 5x$
2. $4x^3 + 16x$

Try to factor the Greatest Common Factor, then factor the binomial, then find the zeros.

3. $4x^2 - 9$
4. $2x^3 + 16$
5. $125x^3 - 1$

Try to factor the Greatest Common Factor, then factor the trinomial, then find the zeros.

6. $x^2 + 5x + 6$
7. $2x^2 - 6x - 8$

Try to factor by grouping, then find the zeros.

8. $x^3 + 5x^2 - 2x - 10$

Try to factor, if you cannot, use *p*'s and *q*'s to factor, then find the zeros.

9. $x^3 - 7x - 6$
10. $3x^4 + 2x^3 + 2x^2 + 2x - 1$

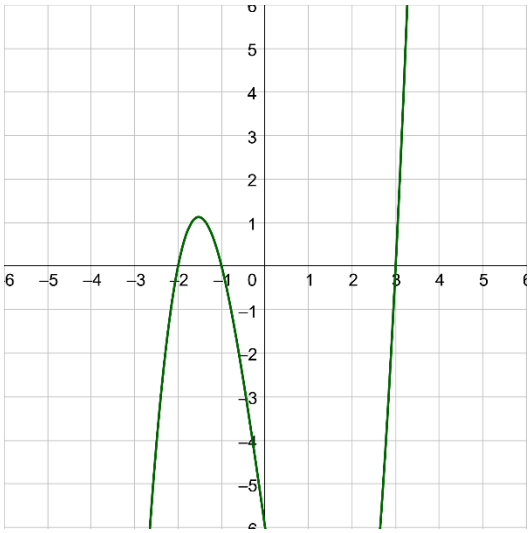

Figure 1: Number 9

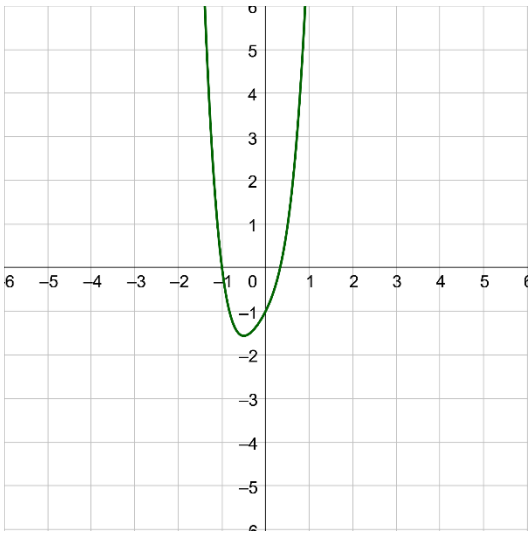

Figure 2: Number 10

Name: _____

Answers

1. $x(3x+5);\ x=0,-\frac{5}{3}$
2. $4x(x^2+4);\ x=0,\pm 2i$
3. $(2x-3)(2x+3);\ x=\frac{3}{2},-\frac{3}{2}$
4. $2(x+2)(x^2-2x+4);\ x=-2,1\pm\sqrt{3}i$
5. $(5x-1)(25x^2+5x+1);\ x=\frac{1}{5},\frac{-1\pm\sqrt{3}i}{10}$
6. $(x+2)(x+3);\ x=-2,-3$
7. $2(x-4)(x+1);\ x=4,-1$
8. $(x+5)(x^2-2);\ x=-5,\pm\sqrt{2}$
9. $(x-3)(x+2)(x+1);\ x=3,-2,-1$
10. $(3x-1)(x+1)(x^2+1);\ x=\frac{1}{3}.-1,\pm i$