Name: Key **Date:** _____

1. Verify that $(x+3)$ is a factor of $f(x) = x^4 + 9x^2 + 18$

$x+3=0$, $x=-3$

-3 | 1 | 0 | 9 | 0 | 18
↓ | | −3 | 9 | −54 | 162
| 1 | −3 | 18 | −54 | 180

↑ Not a zero.

No

2. Determine all of the x-intercepts of:

$f(x) = x(x-3)(2x-5)$

$x=0$ | $x-3=0$, $x=3$ | $2x-5=0$, $2x=5$, $x=\frac{5}{2}$

$x = 0, 3, \frac{5}{2}$

3. Given the zeros, –3, 5, and 2i,

a. What are the factors of the polynomial?

$(x+3)(x-5)(x-2i)(x+2i)$ ★

b. What is the standard form of the polynomial?

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

$(x^2-5x+3x-15)(x^2+2ix-2ix-4i^2)$

$(x^2-2x-15)(x^2+4)$

$x^4+4x^2-2x^3-8x-15x^2-60$

$x^4-2x^3-11x^2-8x-60$

4. Given the zeros, 0, – 4, $\sqrt{3}$, $-\sqrt{3}$,

a. What are the factors of the polynomial?

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

b. What is the standard form of the polynomial?

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

$(x^2+4x)(x^2+x\sqrt{3}-x\sqrt{3}-3)$

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

$x^4-3x^2+4x^3-12x = x^4+4x^3-3x^2-12x$

Find all of the indicated zeros, roots, solutions, or factors:

5. $f(x) = x^3 - 125$

$\sqrt[3]{x^3}=x$, $\sqrt[3]{125}=5$

$(x-5)(x^2+x\cdot5+5^2)$

$(x-5)$ | $(x^2+5x+25)$

$x-5=0$, $x=5$

$\frac{-5\pm\sqrt{(5)^2-4(1)(25)}}{2(1)}$

$\frac{-5\pm\sqrt{-75}}{2}$

$\frac{-5\pm5i\sqrt{3}}{2}$

zeros: $5, \frac{-5}{2}\pm\frac{5i\sqrt{3}}{2}$

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

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

$x^2(2x-1)(x+2)$

$x=0, 0$ | $2x-1=0$, $2x=1$, $x=\frac{1}{2}$ | $x+2=0$, $x=-2$

factors: $x, x, (2x-1)(x+2)$

Find all of the indicated zeros, roots, solutions, or factors:

7. $f(x) = x^3 - 7x^2 + 16x - 12$ 2, 3

2) 1 −7 16 −12
↓ 2 −10 12
3) 1 −5 6 0
↓ 3 −6
1 −2 0

$x - 2$

Factors: $(x-2)(x-2)(x-3)$

8. $f(x) = 3x^3 - 11x^2 - 9x + 50$ −2

−2) 3 −11 −9 50
↓ −6 34 −50
3 −17 25 0

$\frac{17 \pm \sqrt{(-17)^2 - 4(3)(25)}}{2(3)} = \frac{17 \pm \sqrt{-11}}{6} = \frac{17}{6} \pm \frac{i\sqrt{11}}{6}$

Roots: $-2, \frac{17}{6} \pm \frac{i\sqrt{11}}{6}$

9. $f(x) = x^4 - x^3 + x^2 - 7x - 42$ −2, 3

−2) 1 −1 1 −7 −42
↓ −2 6 −14 42
3) 1 −3 7 −21 0
↓ 3 0 21
1 0 7 0

$x^2 + 7 = 0$
$x^2 = -7$
$x = \pm i\sqrt{7}$

Solutions: $-2, 3, \pm i\sqrt{7}$

10. $f(x) = 2x^4 + 3x^3 - 30x^2 - 15x + 100$ −4

−4) 2 3 −30 −15 100
↓ −8 20 40 −100
2 −5 −10 25 0

$(2x^3 - 5x^2)(-10x + 25)$
$x^2(2x-5) - 5(2x-5)$
$(x^2 - 5)(2x-5)$
$x^2 - 5 = 0$; $2x - 5 = 0$
$x^2 = 5$; $2x = 5$
$x = \pm\sqrt{5}$; $x = \frac{5}{2}$

Zeros: $-4, \frac{5}{2}, \pm\sqrt{5}$

11. $f(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$ −3, −2, 1, 2

Factors: $(x+3)(x+2)(x-1)(x-2)$

12. $f(x) = x^4 - 6x^3 - 3x^2 - 24x - 28$ −1, 7

−1) 1 −6 −3 −24 −28
↓ −1 7 −4 28
7) 1 −7 4 −28 0
↓ 7 0 28
1 0 4 0

$x^2 + 4 = 0$
$x^2 = -4$
$x = \pm 2i$

Zeros: $-1, 7, \pm 2i$