Math 3 Name_____

Unit 8.4 Finding Zeros of a Polynomial Easy PRACTICE

Period____

State the possible rational zeros for each function. Then factor each and find all zeros. One zero has been given.

1) $f(x) = x^3 + 6x^2 + x - 34;\ 2$

Possible rational zeros: $\pm 1, \pm 2, \pm 17, \pm 34$
Factors to: $f(x) = (x^2 + 8x + 17)(x - 2)$
Zeros: $\{-4 + i, -4 - i, 2\}$

2) $f(x) = x^3 - 4x^2 - 7x + 10;\ -2$

Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$
Factors to: $f(x) = (x - 1)(x - 5)(x + 2)$
Zeros: $\{1, 5, -2\}$

3) $f(x) = x^4 + 4x^3 - x^2 + 16x - 20;\ -5$

Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20$
Factors to: $f(x) = (x - 1)(x^2 + 4)(x + 5)$
Zeros: $\{1, 2i, -2i, -5\}$

4) $f(x) = x^5 - 2x^4 + 10x^3 - 20x^2 + 16x - 32;\ 2$

Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 32$
Factors to: $f(x) = (x^2 + 8)(x^2 + 2)(x - 2)$
Zeros: $\{2i\sqrt{2}, -2i\sqrt{2}, i\sqrt{2}, -i\sqrt{2}, 2\}$

5) $f(x) = x^5 + 3x^4 + x^3 + 3x^2 - 2x - 6;\ -3$

Possible rational zeros: $\pm 1, \pm 2, \pm 3, \pm 6$
Factors to: $f(x) = (x^2 + 2)(x - 1)(x + 1)(x + 3)$
Zeros: $\{i\sqrt{2}, -i\sqrt{2}, 1, -1, -3\}$

6) $f(x) = x^4 + 13x^3 + 39x^2 + 13x - 42;\ -3$

Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 6, \pm 7, \pm 14, \pm 21, \pm 42$
Factors to: $f(x) = (x + 2)(x^2 + 8x - 7)(x + 3)$
Zeros: $\{-2, -4 + \sqrt{23}, -4 - \sqrt{23}, -3\}$

7) $y = x^5 - 5x^4 + 12x^3 - 60x^2 + 27x - 135;\ 5$

Possible rational zeros:
$\pm 1, \pm 3, \pm 5, \pm 9, \pm 15, \pm 27, \pm 45, \pm 135$
Factors to: $y = (x^2 + 3)(x^2 + 9)(x - 5)$
Zeros: $\{i\sqrt{3}, -i\sqrt{3}, 3i, -3i, 5\}$

8) $y = x^3 + 3x^2 - 4x - 12;\ -2$

Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$
Factors to: $y = (x - 2)(x + 3)(x + 2)$
Zeros: $\{2, -3, -2\}$

9) $y = x^3 + 10x^2 + 36x + 40;\ -2$

Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 5, \pm 8, \pm 10, \pm 20, \pm 40$
Factors to: $y = (x^2 + 8x + 20)(x + 2)$
Zeros: $\{-4 + 2i, -4 - 2i, -2\}$

10) $y = x^5 + 2x^4 - 5x^3 - 10x^2 - 6x - 12;\ -2$

Possible rational zeros:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 12$
Factors to: $y = (x^2 + 1)(x^2 - 6)(x + 2)$
Zeros: $\{i, -i, \sqrt{6}, -\sqrt{6}, -2\}$

11) $y = x^4 - 5x^3 + x - 5;\ 5$

Possible rational zeros: $\pm 1, \pm 5$
Factors to: $y = (x + 1)(x^2 - x + 1)(x - 5)$
Zeros: $\left\{-1, \frac{1 + i\sqrt{3}}{2}, \frac{1 - i\sqrt{3}}{2}, 5\right\}$

12) $y = x^3 - 4x^2 - 7x + 10;\ 5$

Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$
Factors to: $y = (x - 1)(x + 2)(x - 5)$
Zeros: $\{1, -2, 5\}$

State the possible rational roots for each equation. Then factor each and find all roots. One root has been given.

13) $x^3 - 6x^2 - 15x + 100 = 0;\ 5$

Possible rational roots:
$\pm 1, \pm 2, \pm 4, \pm 5, \pm 10, \pm 20, \pm 25, \pm 50, \pm 100$
Factors to: $(x + 4)(x - 5)^2 = 0$
Roots: $\{-4, 5 \text{ mult. } 2\}$

14) $x^4 - 24x^2 - 25 = 0;\ -5$

Possible rational roots: $\pm 1, \pm 5, \pm 25$
Factors to: $(x - 5)(x^2 + 1)(x + 5) = 0$
Roots: $\{5, i, -i, -5\}$

15) $x^5 - 5x^4 + 7x^3 - 35x^2 - 8x + 40 = 0;\ 5$

Possible rational roots:
$\pm 1, \pm 2, \pm 4, \pm 5, \pm 8, \pm 10, \pm 20, \pm 40$
Factors to: $(x^2 + 8)(x - 1)(x + 1)(x - 5) = 0$
Roots: $\{2i\sqrt{2}, -2i\sqrt{2}, 1, -1, 5\}$

16) $x^3 - 7x^2 + 20x - 24 = 0;\ 3$

Possible rational roots:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$
Factors to: $(x^2 - 4x + 8)(x - 3) = 0$
Roots: $\{2 + 2i, 2 - 2i, 3\}$

17) $x^3 + 3x^2 - 10x - 24 = 0;\ 3$

Possible rational roots:
$\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$
Factors to: $(x + 2)(x + 4)(x - 3) = 0$
Roots: $\{-2, -4, 3\}$

18) $x^5 + 2x^4 + 12x^3 + 24x^2 + 27x + 54 = 0;\ -2$

Possible rational roots:
$\pm 1, \pm 2, \pm 3, \pm 6, \pm 9, \pm 18, \pm 27, \pm 54$
Factors to: $(x^2 + 9)(x^2 + 3)(x + 2) = 0$
Roots: $\{3i, -3i, i\sqrt{3}, -i\sqrt{3}, -2\}$