Fundamental Theorem of Algebra Name_____

Date_____

State the possible number of real and imaginary zeros and the possible rational zeros for each function. Then find all zeros.

1) $f(x) = x^3 + 64$

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

3) $f(x) = x^5 - 2x^4 + 5x^3 - 10x^2 - 14x + 28$

4) $f(x) = x^5 - 2x^4 + 11x^3 - 22x^2 + 28x - 56$

5) $f(x) = x^5 + 5x^4 - 6x^3 - 30x^2 - 7x - 35$

6) $f(x) = x^5 - 5x^4 + 4x^3 - 20x^2 + 3x - 15$

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

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

Answers to

1) Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0
Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 8, \pm 16, \pm 32, \pm 64$
Zeros: $\{-4, 2 + 2i\sqrt{3}, 2 - 2i\sqrt{3}\}$

2) Possible # of real zeros: 4, 2, or 0
Possible # of imaginary zeros: 4, 2, or 0
Possible rational zeros: $\pm 1, \pm 2, \pm 5, \pm 10$
Zeros: $\{\sqrt{2}, -\sqrt{2}, i\sqrt{5}, -i\sqrt{5}\}$

3) Possible # of real zeros: 5, 3, or 1
Possible # of imaginary zeros: 4, 2, or 0
Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 7, \pm 14, \pm 28$
Zeros: $\{2, \sqrt{2}, -\sqrt{2}, i\sqrt{7}, -i\sqrt{7}\}$

4) Possible # of real zeros: 5, 3, or 1
Possible # of imaginary zeros: 4, 2, or 0
Possible rational zeros:
$\pm 1, \pm 2, \pm 4, \pm 7, \pm 8, \pm 14, \pm 28, \pm 56$
Zeros: $\{2, i\sqrt{7}, -i\sqrt{7}, 2i, -2i\}$

5) Possible # of real zeros: 5, 3, or 1
Possible # of imaginary zeros: 4, 2, or 0
Possible rational zeros: $\pm 1, \pm 5, \pm 7, \pm 35$
Zeros: $\{-5, \sqrt{7}, -\sqrt{7}, i, -i\}$

6) Possible # of real zeros: 5, 3, or 1
Possible # of imaginary zeros: 4, 2, or 0
Possible rational zeros: $\pm 1, \pm 3, \pm 5, \pm 15$
Zeros: $\{5, i\sqrt{3}, -i\sqrt{3}, i, -i\}$

7) Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0
Possible rational zeros: $\pm 1, \pm 2, \pm 4$
Zeros: $\{4, i, -i\}$

8) Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0
Possible rational zeros: $\pm 1, \pm 3$
Zeros: $\{-3, 1, -1\}$