Irrational and Imaginary Root Theorems

Date_____ Period____

State the number of complex zeros and the possible number of real and imaginary zeros for each function.

1) $f(x) = x^2 + 6x - 38$

2) $f(x) = x^4 - 9x^2 + 18$

3) $f(x) = 5x^5 + 36x^3 + 7x$

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

5) $f(x) = 27x^6 + 208x^3 - 64$

6) $f(x) = 27x^9 + 8x^6 - 27x^3 - 8$

A polynomial function with rational coefficients has the follow zeros. Find all additional zeros.

7) $-5,\ \ i$

8) $-1 + i,\ \ \sqrt{5}$

9) $-3 + \sqrt{5},\ \ -i$

10) $2,\ \ -2 + \sqrt{10}$

11) $-1,\ \ 5,\ \ -2 + \sqrt{5}$

12) $2 - 2i,\ \ 1 - 2i,\ \ 1 + 2i$

13) $2 - 3i$ mult. 2

14) $-\frac{5}{2}$, $\sqrt{5}$ mult. 2

Write a polynomial function of least degree with integral coefficients that has the given zeros.

15) $0,\ 2,\ \sqrt{3}$

16) $-5,\ \sqrt{3}$

17) $-1,\ 2i$

18) $2i,\ -2i,\ 2+2i$

19) $-2i,\ 2+2\sqrt{2}$

20) $\sqrt{6},\ -3+\sqrt{5}$

Critical thinking questions:

21) Write a polynomial function of fifth degree with integral coefficients that has $2i$ as a zero.

22) True or False: A polynomial function of third degree with integral coefficients can have 2 and $2i$ as zeros.

Irrational and Imaginary Root Theorems

Date_____ Period____

State the number of complex zeros and the possible number of real and imaginary zeros for each function.

1) $f(x) = x^2 + 6x - 38$

# of complex zeros: 2
Possible # of real zeros: 2 or 0
Possible # of imaginary zeros: 2 or 0

2) $f(x) = x^4 - 9x^2 + 18$

# of complex zeros: 4
Possible # of real zeros: 4, 2, or 0
Possible # of imaginary zeros: 4, 2, or 0

3) $f(x) = 5x^5 + 36x^3 + 7x$

# of complex zeros: 5
Possible # of real zeros: 5, 3, or 1
Possible # of imaginary zeros: 4, 2, or 0

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

# of complex zeros: 3
Possible # of real zeros: 3 or 1
Possible # of imaginary zeros: 2 or 0

5) $f(x) = 27x^6 + 208x^3 - 64$

# of complex zeros: 6
Possible # of real zeros: 6, 4, 2, or 0
Possible # of imaginary zeros: 6, 4, 2, or 0

6) $f(x) = 27x^9 + 8x^6 - 27x^3 - 8$

# of complex zeros: 9
Possible # of real zeros: 9, 7, 5, 3, or 1
Possible # of imaginary zeros: 8, 6, 4, 2, or 0

A polynomial function with rational coefficients has the follow zeros. Find all additional zeros.

7) $-5,\ i$

$-i$

8) $-1 + i,\ \sqrt{5}$

$-1 - i,\ -\sqrt{5}$

9) $-3 + \sqrt{5},\ -i$

$-3 - \sqrt{5},\ i$

10) $2,\ -2 + \sqrt{10}$

$-2 - \sqrt{10}$

11) $-1,\ 5,\ -2 + \sqrt{5}$

$-2 - \sqrt{5}$

12) $2 - 2i,\ 1 - 2i,\ 1 + 2i$

$2 + 2i$

13) $2 - 3i$ mult. 2

$2 + 3i$ mult. 2

14) $-\frac{5}{2}$, $\sqrt{5}$ mult. 2

$-\sqrt{5}$ mult. 2

Write a polynomial function of least degree with integral coefficients that has the given zeros.

15) 0, 2, $\sqrt{3}$

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

16) -5, $\sqrt{3}$

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

17) -1, $2i$

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

18) $2i$, $-2i$, $2 + 2i$

$f(x) = x^4 - 4x^3 + 12x^2 - 16x + 32$

19) $-2i$, $2 + 2\sqrt{2}$

$f(x) = x^4 - 4x^3 - 16x - 16$

20) $\sqrt{6}$, $-3 + \sqrt{5}$

$f(x) = x^4 + 6x^3 - 2x^2 - 36x - 24$

Critical thinking questions:

21) Write a polynomial function of fifth degree with integral coefficients that has $2i$ as a zero.

Many answers. Ex: $f(x) = x^5 + 4x^3$

22) True or False: A polynomial function of third degree with integral coefficients can have 2 and $2i$ as zeros.

True