

MATH 250/GRACEY
3.3-3.4 PRACTICE

Name_____

Find the zeros of the polynomial function and state the multiplicity of each.

1) $f(x) = (x + 5)^2(x - 1)$

2) $f(x) = 4(x + 9)^2(x - 9)^3$

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

4) $f(x) = (x^2 + 11x + 30)^2$

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

8) Find a polynomial function of degree 3 with $1 + 5i$, $1 - 5i$, -1 as zeros.

9) Find a polynomial function of degree 3 with $\sqrt{5}$, $-\sqrt{5}$, $\sqrt{6}$ as zeros.

10) Find a polynomial of degree 5 with -3 as a zero of multiplicity 3, 0 as a zero of multiplicity 1, and 4 as a zero of multiplicity 1.

Provide the requested response.

11) Suppose that a polynomial function of degree 5 with rational coefficients has 6 , $-5 + 4i$, $4 - \sqrt{3}$ as zeros. Find the other zeros.

Find the requested polynomial.

6) Find a polynomial function of degree 3 with -1 , 3 , 5 as zeros.

7) Find a polynomial function of degree 3 with 2 , i , $-i$ as zeros.

12) Suppose that a polynomial function of degree 6 with rational coefficients has $2i$, $-2 + 4i$, $4 - \sqrt{3}$ as zeros. Find the other zeros.

Find a polynomial function of lowest degree with rational coefficients that has the given numbers as some of its zeros.

13) $4i, \sqrt{8}$

14) $2 + i, 2$

15) $1 - \sqrt{3}, 1 + i$

17) $f(x) = x^4 - 8x^3 + 14x^2 - 8x + 13; i$

18) $f(x) = x^4 - 36; \sqrt{6}$

Give all possible rational zeros for the polynomial.

19) $P(x) = 2x^3 + 5x^2 + 13x - 8$

Given that the polynomial function has the given zero, find the other zeros.

16) $f(x) = x^3 - 4x^2 + 9x - 10; 2$

20) $P(x) = -2x^4 + 4x^3 + 3x^2 + 18$

Given the polynomial function $f(x)$, find the rational zeros, then the other zeros (that is, solve the equation $f(x) = 0$), and factor $f(x)$ into linear factors.

21) $f(x) = x^3 + 7x^2 - 5x - 35$

22) $f(x) = x^3 - 12x - 16$

23) $f(x) = 6x^3 + 19x^2 + 8x - 5$

Find only the rational zeros.

24) $f(x) = 3x^3 + 7x^2 - 22x - 8$

25) $x^4 - 9x^3 + 5x^2 + 27x - 24$

What does Descartes' rule of signs tell you about the number of positive real zeros and the number of negative real zeros of the function?

26) $6x^3 - 3x^2 + 3x + 3 = 0$

27) $9x^8 + 8x^6 + 2x^4 + 6x^2 + 5 = 0$

28) $-7x^4 + 4x^3 - 9x^2 + 6x - 5 = 0$

29) $-3x^4 - 5x^3 - 5x^2 - 4x + 4 = 0$

Answer Key

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- 1) -5, multiplicity 2; 1, multiplicity 1
- 2) -9, multiplicity 2; 9, multiplicity 3
- 3) -3, multiplicity 3; 0, multiplicity 2; 6, multiplicity 1
- 4) -5, multiplicity 2; -6, multiplicity 2
- 5) -1, multiplicity 1; $\sqrt{5}$, multiplicity 1; $-\sqrt{5}$, multiplicity 1
- 6) $f(x) = x^3 - 7x^2 + 7x + 15$
- 7) $f(x) = x^3 - 2x^2 + x - 2$
- 8) $f(x) = x^3 - x^2 + 24x + 26$
- 9) $f(x) = x^3 - \sqrt{6}x^2 - 5x + 5\sqrt{6}$
- 10) $f(x) = x^5 + 5x^4 - 9x^3 - 81x^2 - 108x$
- 11) $-5 - 4i, 4 + \sqrt{3}$
- 12) $-2i, -2 - 4i, 4 + \sqrt{3}$
- 13) $f(x) = x^4 + 8x^2 - 128$
- 14) $f(x) = x^3 - 6x^2 + 13x - 10$
- 15) $f(x) = x^4 - 4x^3 + 4x^2 - 4$
- 16) $1 + 2i, 1 - 2i$
- 17) $-i, 4 + \sqrt{3}, 4 - \sqrt{3}$
- 18) $-\sqrt{6}i, \sqrt{6}i, -\sqrt{6}$
- 19) $\pm 1, \pm 1/2, \pm 2, \pm 4, \pm 8$
- 20) $\pm 1, \pm 1/2, \pm 2, \pm 3, \pm 3/2, \pm 6, \pm 9, \pm 9/2, \pm 18$
- 21) $-7, -\sqrt{5}, \sqrt{5}; f(x) = (x + 7)(x + \sqrt{5})(x - \sqrt{5})$
- 22) -2 , multiplicity 2; 4; $f(x) = (x + 2)^2(x - 4)$
- 23) $-1, -\frac{5}{2}, \frac{1}{3}; f(x) = \left(x + 1\right)\left(x + \frac{5}{2}\right)\left(x - \frac{1}{3}\right)$
- 24) $-4, 2, -1/3$
- 25) 8, 1
- 26) Positive (2,0), negative (1)
- 27) Positive (0), negative (0)
- 28) Positive (4,2,0), negative (0)
- 29) Positive (1), negative (3,1)