Algebra 2

Polynomials - Test Review
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Factor each.

1) \( x^3 - x^2 + 2x - 2 = 0 \)

2) \( x^3 - 2x^2 + 2x - 4 = 0 \)

3) \( x^3 + 3x^2 + 5x + 15 = 0 \)

4) \( x^3 - 5x^2 + x - 5 = 0 \)

5) \( x^3 + 64 = 0 \)

6) \( x^3 + 27 = 0 \)

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

7) \(-3, -2, 4\)

8) \(\sqrt{2}, i\)

9) \(2, \sqrt{6}\)

10) \(-4, 2i\)

11) \(1, 2i\)

12) \(-1, 2, 0\)
State the possible rational zeros for each function. Then find all rational zeros.

13) \( f(x) = 2x^3 - 6x^2 + 5x - 15 \)

14) \( f(x) = 4x^3 - x^2 + 20x - 5 \)

15) \( f(x) = 2x^3 + x^2 - 4x - 2 \)

16) \( f(x) = 3x^3 - 6x^2 + 4x - 8 \)

Describe the end behavior of each function.

17) \( f(x) = -x^5 + 4x^3 - 2x - 2 \)

18) \( f(x) = x^2 + 4x + 6 \)

19) \( f(x) = -x^5 + 2x^3 - x + 2 \)

20) \( f(x) = x^4 - 2x^2 + 2x - 1 \)

21) \( f(x) = -x^4 - x^3 + 3x^2 - 1 \)

22) \( f(x) = -x^3 + 15x^2 - 72x + 110 \)

23) \( f(x) = x^5 - 4x^3 + x + 1 \)

24) \( f(x) = x^2 + 4x + 1 \)

Factor each and find all roots. One factor has been given.

25) \( x^4 - 7x^3 + 9x^2 + 7x - 10 = 0; \ x - 2 \)

26) \( x^4 - 13x^3 - 3x^2 + 41x - 26 = 0; \ x + 2 \)
27) \(x^4 + 10x^3 - 40x^2 - 10x + 39 = 0; \ x - 3\)

28) \(x^4 - 15x^3 + 49x^2 - 57x + 22 = 0; \ x - 2\)

29) Sketch the graph of a 3rd degree polynomial with a positive leading coefficient, with exactly one positive double root and one negative real root.

30) Sketch the graph of a 4th degree polynomial with a negative leading coefficient, with exactly one positive double root and one negative double root.

31) Write the simplest polynomial equation in FACTORED form for the graph below.

32) Write the simplest polynomial equation in FACTORED form for the graph below.
Answers to Polynomials - Test Review (ID: 1)

1) $(x - 1)(x^2 + 2) = 0$  
2) $(x - 2)(x^2 + 2) = 0$  
3) $(x + 3)(x^2 + 5) = 0$  
4) $(x - 5)(x^2 + 1) = 0$  
5) $(x + 4)(x^2 - 4x + 16) = 0$  
6) $(x + 3)(x^2 - 3x + 9) = 0$  
7) $f(x) = x^3 + x^2 - 14x - 24$  
8) $f(x) = x^3 - x^2 - 2$  
9) $f(x) = x^3 - 2x^2 - 6x + 12$  
10) $f(x) = x^3 + 4x^2 + 4x + 16$  
11) $f(x) = x^3 - x^2 + 4x - 4$  
12) $f(x) = x^3 - x^2 - 2x$  

13) Possible rational zeros:

$$\pm 1, \pm 3, \pm 5, \pm 15, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{5}{2}, \pm \frac{15}{2}$$

Rational zeros: \{3\}

14) Possible rational zeros:

$$\pm 1, \pm 5, \pm \frac{1}{2}, \pm \frac{5}{2}, \pm \frac{1}{4}, \pm \frac{5}{4}$$

Rational zeros: \{1\}

15) Possible rational zeros: $\pm 1, \pm 2, \pm \frac{1}{2}$

Rational zeros: \{-1/2\}

16) Possible rational zeros:

$$\pm 1, \pm 2, \pm 4, \pm 8, \pm \frac{1}{3}, \pm \frac{2}{3}, \pm \frac{4}{3}, \pm \frac{8}{3}$$

Rational zeros: \{2\}

17) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to -\infty$ as $x \to +\infty$

18) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

19) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to -\infty$ as $x \to +\infty$

20) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

21) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

22) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

23) $f(x) \to -\infty$ as $x \to -\infty$

$f(x) \to -\infty$ as $x \to +\infty$

24) $f(x) \to +\infty$ as $x \to -\infty$

$f(x) \to +\infty$ as $x \to +\infty$

25) Factors to: $(x - 1)(x - 5)(x + 1)(x - 2) = 0$

Roots: \{1, 5, -1, 2\}

26) Factors to: $(x - 1)^2(x - 13)(x + 2) = 0$

Roots: \{1 mult. 2, 13, -2\}

27) Factors to: $(x + 13)(x - 1)(x + 1)(x - 3) = 0$

Roots: \{-13, 1, -1, 3\}

28) Factors to: $(x - 1)^2(x - 11)(x - 2) = 0$

Roots: \{1 mult. 2, 11, 2\}

29) The dot next to the choice indicates that it is the answer.

30) The dot next to the choice indicates that it is the answer.

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

32) $-(x + 3)(x + 1)^2(x - 1)$