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3.18 PreTest: Rational exponents and complex numbers A2.A.APR.6

A2-APR.1 Perform operations with polynomials

1. Find the sum in standard form:

$$(2x^2 - 3x - 5) + (x^2 - 6x + 9).$$

2. Find the difference $f(x) - g(x)$ as a polynomial in standard form, given:

$$f(x) = 4x^4 - x^3 + 6x^2 - 2x + 3 \quad \text{and} \quad g(x) = x^4 + 3x^2 - 2x - 4.$$

3. Select each correct equation.

(a) $x^2 - 16 = x^2 - 4^2$

(b) $x^2 - 16 = (x - 4)(x + 4)$

(c) $x^2 + 16 = (x - 4)(x + 4)$

(d) $x^2 - 8x + 16 = (x - 4)^2$

(e) $x^2 + 8x + 16 = (x + 4)^2$

(f) $x^2 - 8x - 16 = (x - 4)^2$

4. Which equations represent correct polynomial identities?

(a) $x^3 + y^3 = (x + y)^3$

(b) $x^3 + y^3 = (x - y)(x^2 + xy + y^2)$

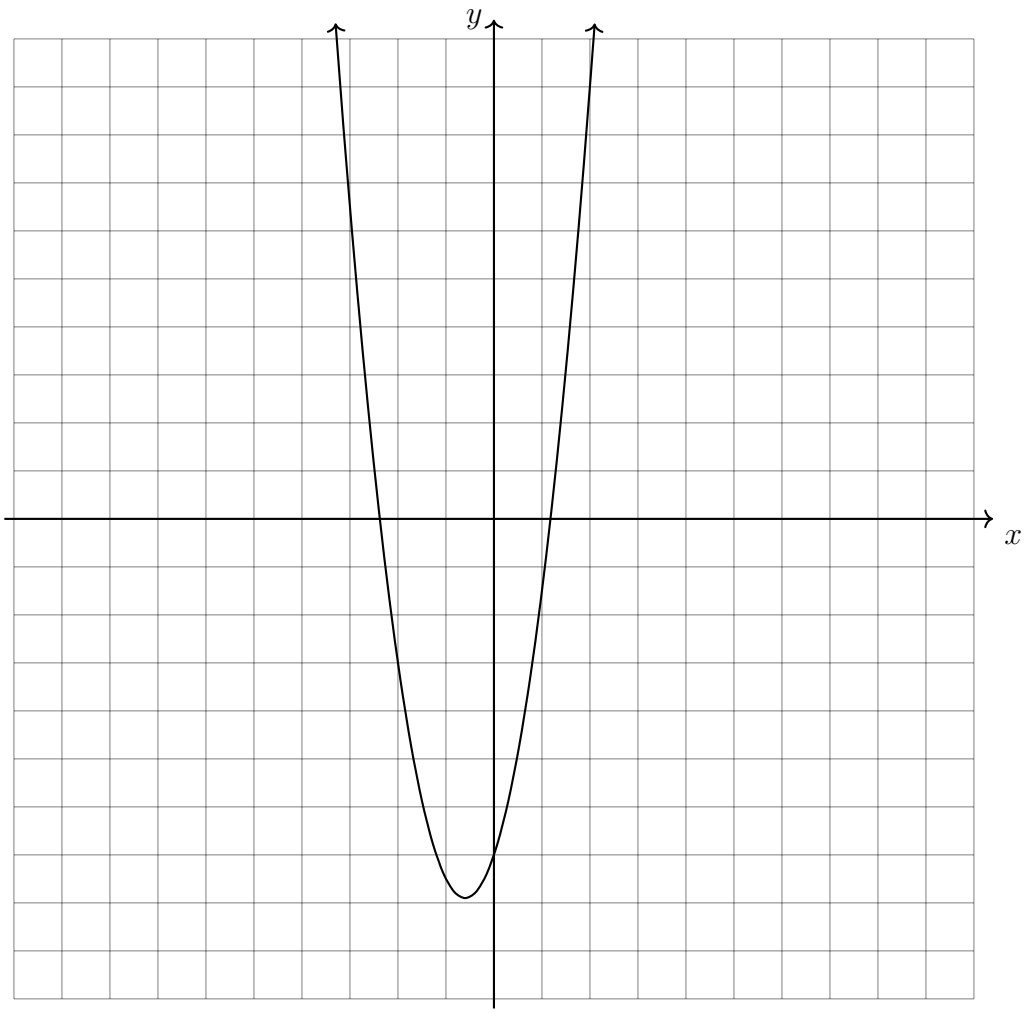
(c) $x^3 - y^3 = (x + y)(x^2 - xy + y^2)$

(d) $x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

A2-F.IF.7a Graph linear and quadratic functions, show key features

5. One equation of a system is graphed.
   (a) Graph the second equation, labeling the intersections as ordered pairs.
   (b) Find the value of the leading coefficient a of the quadratic equation.

$y = ax^2 + 3x - 7$ $\qquad\qquad$ $3x - y = -3$



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A2-A.APR.3 Identify zeros of polynomials given suitable factorizations

6. Write down the solutions to the equation $x(x-1)(2x+5)(x+4)=0$.

7. The polynomial p is a function of x. The graph of p has three zeros at -5, $\frac{3}{2}$, and -1. Select **all** the expressions that could represent p.

   (a) $(x-5)(x-\frac{3}{2})(x+1)$
   (b) $(x+5)(3x-2)(x+1)$
   (c) $3(x+5)(x-\frac{3}{2})(x+1)$
   (d) $3x(x+5)(x+\frac{2}{3})(x-1)^2$
   (e) $(x-5)(x+\frac{2}{3})(x-1)$
   (f) $(x+5)(2x-3)(x+1)$
   (g) $3(x-5)(x-\frac{2}{3})(x-1)$
   (h) $3x(x+5)(x-\frac{3}{2})(x+1)^2$

8. Select the expression that is equivalent to $\dfrac{3x^2+10x-18}{x-2}$ for $x \neq 2$.

   (a) $3x+4+\dfrac{16}{x-2}$
   (b) $3x+16+\dfrac{10}{x-2}$
   (c) $3x+4+\dfrac{8}{x-2}$
   (d) $3x+16+\dfrac{14}{x-2}$

A2-F.BF.2 Write arithmetic and geometric sequences with recursive formulas

9. Write a recursive definition of the sequence $a_1 = -3$, $a_2 = 2$, $a_3 = 7$, $a_4 = 12, \ldots$

10. Write a recursive definition of the geometric sequence b.

n	b_n
1	12
2	1.2
3	0.12

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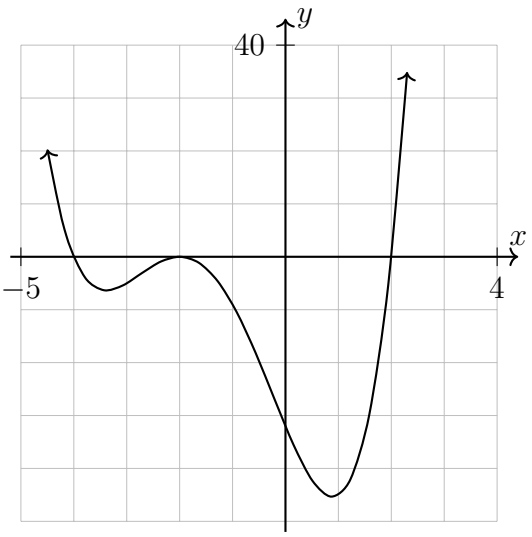
A2-F.IF.7c Graph polynomials, identify zeros, end behavior

11. Below is a graph of the polynomial $f(x)$.



(a) Is the leading coefficient positive or negative?

(b) Which of the following could be its equation?

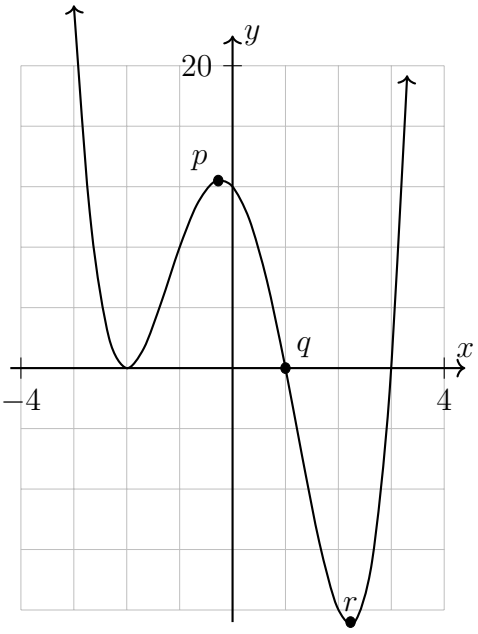
i. $f(x) = (x+2)(x-4)(x-2)^2$

ii. $f(x) = (x-2)(x-4)(x+2)^2$

iii. $f(x) = (x+2)(x+4)(x-2)^2$

iv. $f(x) = (x-2)(x+4)(x+2)^2$

12. The graph of the polynomial $f(x) = x^4 - 9x^2 - 4x + 12$ is shown.



(a) What is the degree of the function?

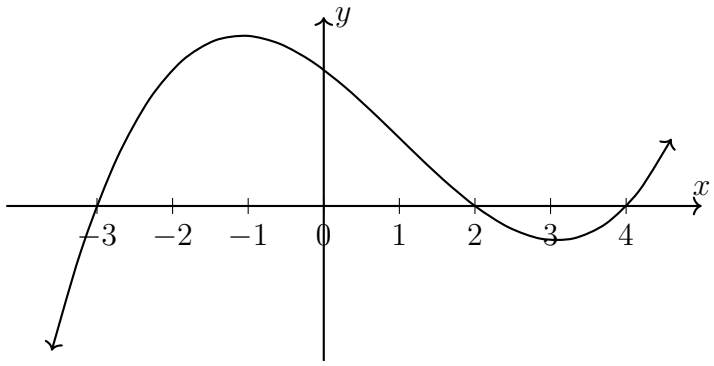
(b) What are the zeros of the function?

(c) Which factor has a multiplicity of 2?

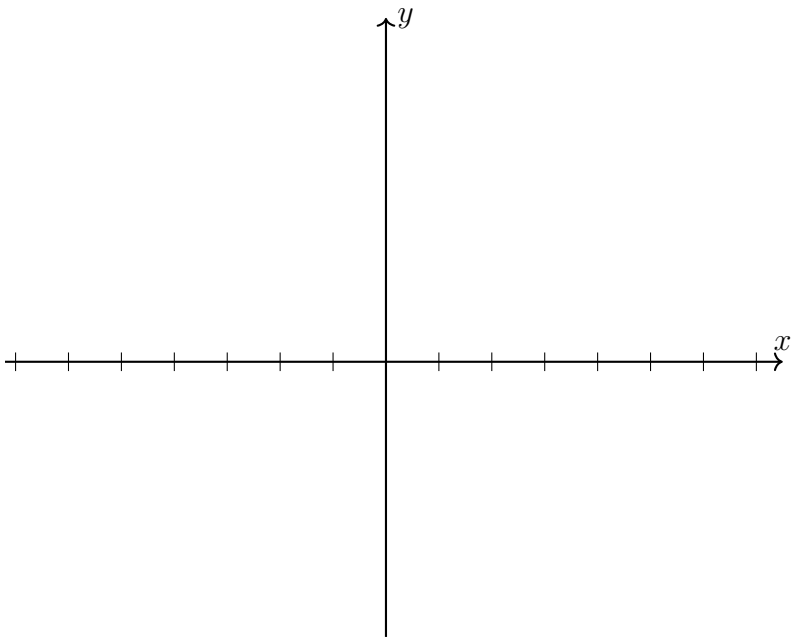
(d) Write down the y-intercept as an ordered pair.

(e) Three points are marked on the graph, p, q, and r. Which one is a local minimum?

13. The graph of the function $f(x) = x^3 - 3x^2 - 10x + 24$ is shown. Write the function in factored form.



14. Let $j(x) = (x + 4)(x + 1)(x - 4)^2$ be a polynomial function.



(a) Sketch a graph of the function. Label the x-intercepts.

(b) Find the value of the y-intercept and mark it on the graph.

(c) Identify the end behavior of the function.

i. As $x \to +\infty$, $y \to +\infty$;
as $x \to -\infty$, $y \to -\infty$

ii. As $x \to +\infty$, $y \to -\infty$;
as $x \to -\infty$, $y \to +\infty$

iii. As $x \to +\infty$, $y \to +\infty$;
as $x \to -\infty$, $y \to +\infty$

iv. As $x \to +\infty$, $y \to -\infty$;
as $x \to -\infty$, $y \to -\infty$

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HSN.RN.2 Expressions with radicals and rational exponents

15. Simplify each radical expression.

(a) $\sqrt{49} =$

(b) $\sqrt{32} =$

(c) $\sqrt{-45} =$

(d) $\dfrac{\sqrt{-12}}{\sqrt{3}} =$

16. Simplify each expression.

(a) $8^{\frac{2}{3}} =$

(b) $\left(\sqrt{\frac{4}{9}}\right)^3 =$

17. Rewrite each expression as a fractional exponent in simplest terms.

(a) $\sqrt[3]{3} =$

(b) $\dfrac{1}{\sqrt[2]{3}} =$

(c) $\sqrt[4]{x^3} =$

(d) $\dfrac{1}{(\sqrt[4]{x})^2} =$

18. Rewrite each expression with fractional exponent as a radical.

(a) $3^{\frac{1}{2}} =$

(b) $3^{-\frac{2}{3}} =$

(c) $x^{\frac{1}{3}} =$

(d) $x^{-\frac{2}{3}} =$

A2-A.SSE.3c Apply the properties of exponents

19. Identify the expressions that are equal to $\dfrac{3^3}{3^5}$

(a) 3^{-2}

(b) $\frac{1}{9}$

(c) 3^3

(d) 3^8

(e) $\dfrac{1}{3^2}$

(f) 0.111

20. Identify the expressions that are equal to 5^{-2}

(a) $\dfrac{1}{5^2}$

(b) 5.5

(c) $\sqrt{5}$

(d) $\dfrac{1}{25}$

(e) 0.04

(f) 10

21. Identify the expressions that are equal to $16^{\frac{1}{4}}$

(a) 2

(b) 4

(c) $\sqrt{4}$

(d) $\sqrt[4]{16}$

(e) 16.25

(f) 256

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22. If $(6 - ki)^2 = 27 - 36i$, the value of k is

    (a) -36

    (b) -3

    (c) 3

    (d) 6

23. Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

6.EE.b Reason about and solve one-variable equations and inequalities

24. Use the function $f(x) = \frac{1}{2}x + 11$ to answer the questions.

    (a) Find the value of $f(4)$.

    (b) Solve for x if $f(x) = 2$.

25. Solve each equation for x.

    (a) $x^2 + 5x + 6 = 0$

    (b) $x^3 - 7x^2 + 6x = 0$

26. The expression $2 - \dfrac{x-1}{x+2}$ is equivalent to

    (a) $1 - \dfrac{3}{x+2}$

    (b) $1 + \dfrac{3}{x+2}$

    (c) $1 - \dfrac{1}{x+2}$

    (d) $1 + \dfrac{1}{x+2}$

27. Find all of the values of x that make the equation true.

$$\frac{3}{x-4} = \frac{x-5}{x}$$

28. Given the rational function $r(x) = 3 - \dfrac{x-1}{x+2}$.

    (a) Sketch a graph of the function.

    (b) Mark the vertical asymptote as dotted line and label it with its equation.

    (c) Explain why the asymptote is located there.