

**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)  $x^2 - 16 = x^2 - 4^2$

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

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

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

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

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

4. Which equations represent correct polynomial identities?

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

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

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

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

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

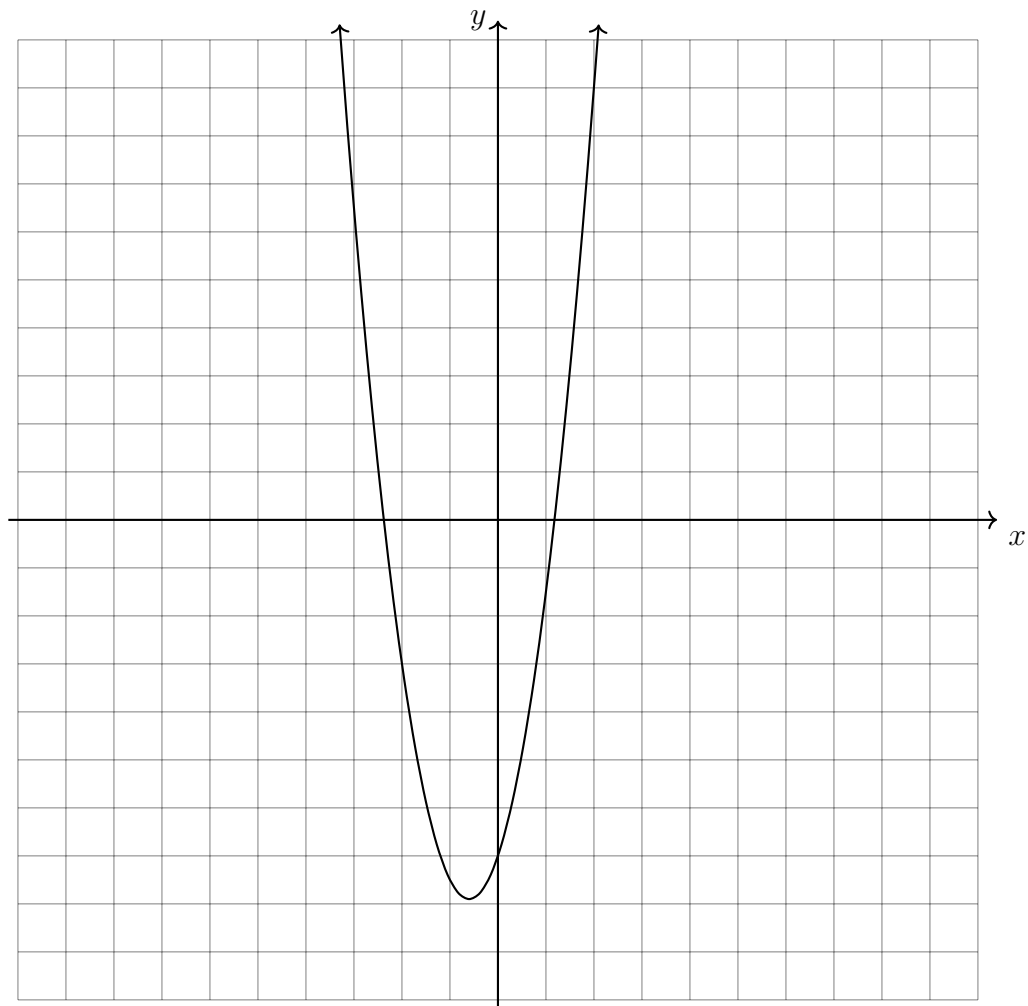
5. One equation of a system is graphed.

(a) Graph the second equation, labeling the intersections as ordered pairs.

(b) Find the value of the leading coefficient  $a$  of the quadratic equation.

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

$$3x - y = -3$$



**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) $(x-5)(x-\frac{3}{2})(x+1)$     | (e) $(x-5)(x+\frac{2}{3})(x-1)$     |
| (b) $(x+5)(3x-2)(x+1)$              | (f) $(x+5)(2x-3)(x+1)$              |
| (c) $3(x+5)(x-\frac{3}{2})(x+1)$    | (g) $3(x-5)(x-\frac{2}{3})(x-1)$    |
| (d) $3x(x+5)(x+\frac{2}{3})(x-1)^2$ | (h) $3x(x+5)(x-\frac{3}{2})(x+1)^2$ |
8. Select the expression that is equivalent to  $\frac{3x^2 + 10x - 18}{x - 2}$  for  $x \neq 2$ .
- |                                |
|--------------------------------|
| (a) $3x + 4 + \frac{16}{x-2}$  |
| (b) $3x + 16 + \frac{10}{x-2}$ |
| (c) $3x + 4 + \frac{8}{x-2}$   |
| (d) $3x + 16 + \frac{14}{x-2}$ |

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

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

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

$n$	$b_n$
1	12
2	1.2
3	0.12

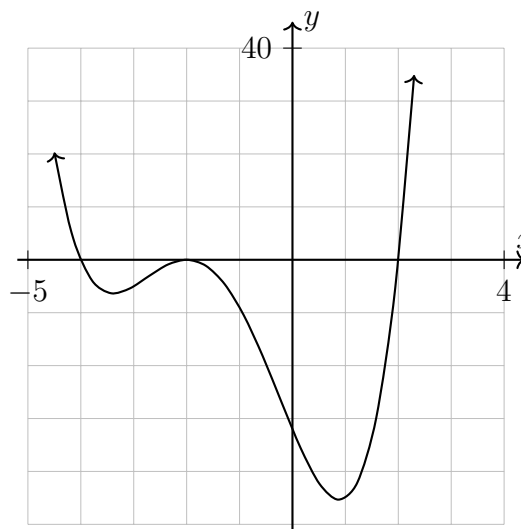
**A2-F.IF.7c Graph polynomials, identify zeros, end behavior**

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.

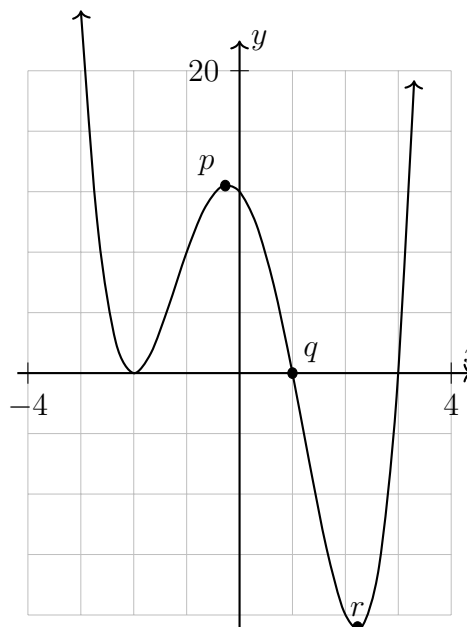
(a) What is the degree of the function?

(b) What are the zeros of the function?

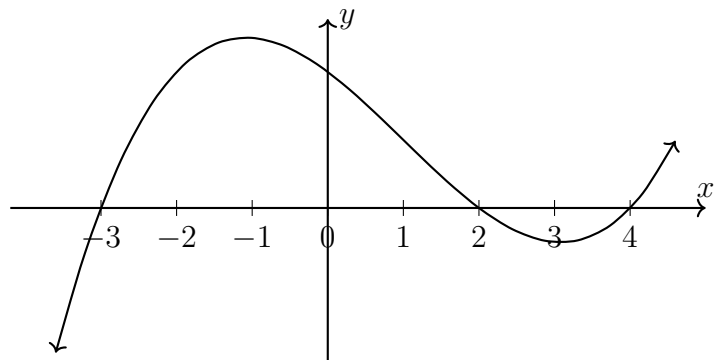
(c) Which factor has a multiplicity of 2?

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

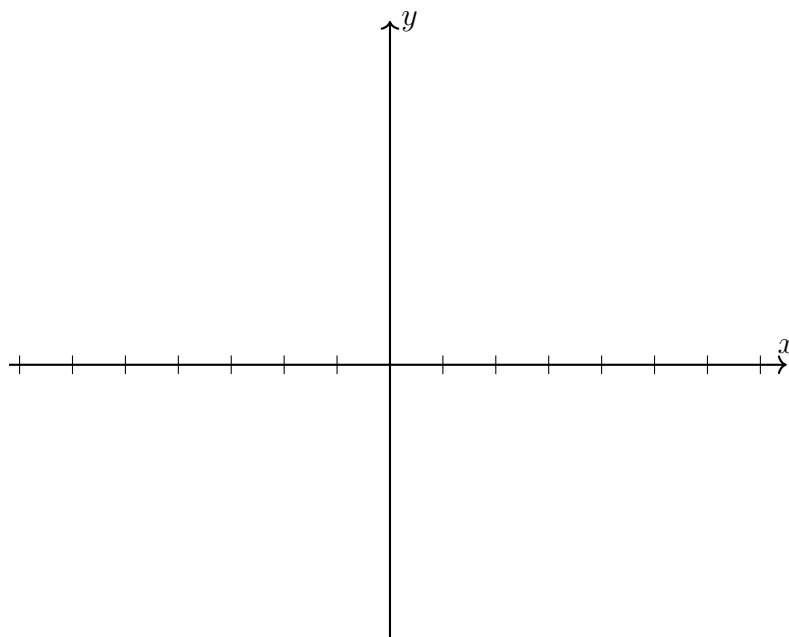
(e) Three points are marked on the graph,  $p$ ,  $q$ , and  $r$ . Which one is a local minimum?



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.
- |   |  |
|---|--|
| <p>i. As <math>x \rightarrow +\infty</math>, <math>y \rightarrow +\infty</math>;<br/>as <math>x \rightarrow -\infty</math>, <math>y \rightarrow -\infty</math></p>  | <p>iii. As <math>x \rightarrow +\infty</math>, <math>y \rightarrow +\infty</math>;<br/>as <math>x \rightarrow -\infty</math>, <math>y \rightarrow +\infty</math></p> |
| <p>ii. As <math>x \rightarrow +\infty</math>, <math>y \rightarrow -\infty</math>;<br/>as <math>x \rightarrow -\infty</math>, <math>y \rightarrow +\infty</math></p> | <p>iv. As <math>x \rightarrow +\infty</math>, <math>y \rightarrow -\infty</math>;<br/>as <math>x \rightarrow -\infty</math>, <math>y \rightarrow -\infty</math></p>  |

**HSN.RN.2 Expressions with radicals and rational exponents**

15. Simplify each radical expression.

(a)  $\sqrt{49} =$

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

(b)  $\sqrt{32} =$

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

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

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

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

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

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

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

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

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

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

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

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

(a)  $3^{-2}$

(d)  $3^8$

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

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

(c)  $3^3$

(f) 0.111

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

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

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

(b) 5.5

(e) 0.04

(c)  $\sqrt{5}$

(f) 10

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

(a) 2

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

(b) 4

(e) 16.25

(c)  $\sqrt{4}$

(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  $2 - \frac{x-1}{x+2}$  is equivalent to

- (a)  $1 - \frac{3}{x+2}$
- (b)  $1 + \frac{3}{x+2}$
- (c)  $1 - \frac{1}{x+2}$
- (d)  $1 + \frac{1}{x+2}$

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  $r(x) = 3 - \frac{x-1}{x+2}$ .

- (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.

