

Polynomial and Rational Functions

1 What set describes the domain of this function?

$$f(x) = \frac{-1x + 1}{1x^2 + 1x - 2}$$

A $\{X \in \mathbb{R} | X < -2 \text{ or } -2 < X < 1 \text{ or } 1 < X\}$

B $\{X \in \mathbb{R} | X < -2 \text{ or } -2 \leq X \leq 1 \text{ or } -1 < X < 1\}$

2 What set describes the domain of this function?

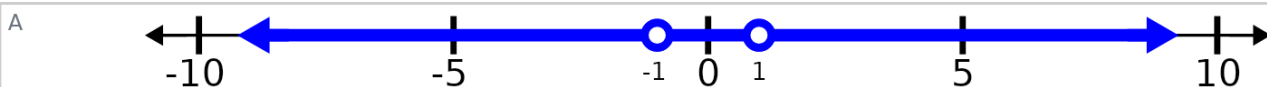
$$f(x) = \frac{2}{1x^2 - 4x + 3}$$

A $\{X \in \mathbb{R} | X < 1 \text{ or } 1 < X < 3 \text{ or } 3 < X\}$

B $\{X \in \mathbb{R} | -1 < X < 1 \text{ or } 1 \leq X \leq 3 \text{ or } -3 \leq X \leq 3\}$

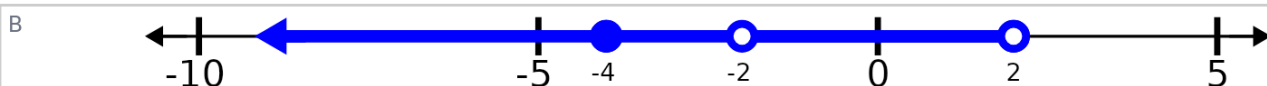
3 What number line shows the domain of this function?

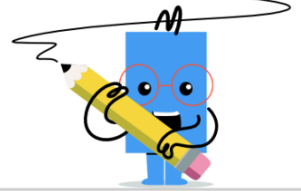
$$f(x) = \frac{-1x - 0}{5x^2 - 0x - 5}$$



4 What number line shows the domain of this function?

$$f(x) = \frac{2}{3x^2 + 6x - 24}$$





Polynomial and Rational Functions

- 5 What set describes the domain of this function?

$$f(x) = \frac{1x - 1}{4x^2 + 2x + 10}$$

A $\{X \in \mathbb{R} | \}$

B $\{X \in \mathbb{R} | X < 6\}$

- 6 What set describes the domain of this function?

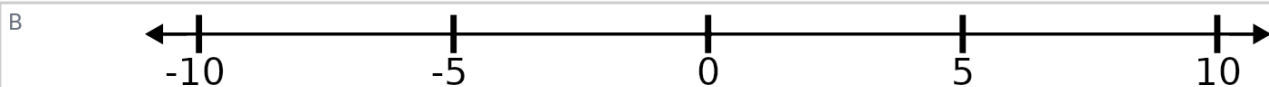
$$f(x) = \frac{-1}{-5x^2 + 4x - 10}$$

A $\{ \}$

B $\{X \in \mathbb{R} | \}$

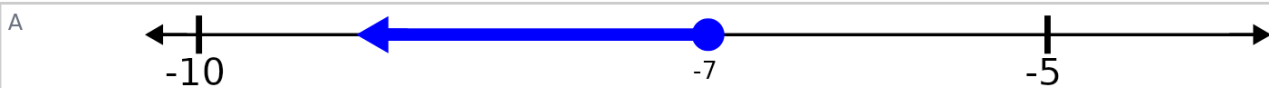
- 7 What number line shows the domain of this function?

$$f(x) = \frac{-1x + 3}{2x^2 - 0x + 23}$$



- 8 What number line shows the domain of this function?

$$f(x) = \frac{4}{5x^2 + 9x + 25}$$



- 9 Factor this higher order polynomial

$$36q^4 + 66q^2 + 24$$

A $(6q^2 + 8)(6q^2 + 3)$

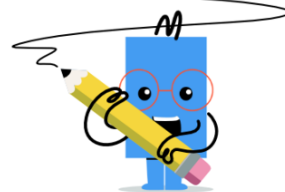
B $(36q^2 + 8)(36q^2 + 3)$

- 10 Use grouping to factor this order 3 polynomial fully

$$m^3 - 2m^2 - 36m + 72$$

A $(m - 2)(m - 6)(m + 6)$

B $(m - 2)(m + 6)(m + 6)$



Polynomial and Rational Functions

- 11** Use synthetic division to divide this polynomial by this binomial. What is the result?

$$\frac{x^3 - 2x^2 - x + 2}{(x - 0)}$$

A $2x^2 - 2x - 1 + \frac{2}{(x - 0)}$

B $x^2 - 2x - 1 - \frac{2}{(x - 0)}$

C $x^3 - 2x^2 - x + 2$

D $x^2 - 2x - 1 + \frac{2}{(x - 0)}$

- 12** Use synthetic division to divide this polynomial by this binomial. What is the result?

$$\frac{x^4 + 4x^3 - x^2 - 16x - 12}{(x + 1)}$$

A $x^3 + 3x^2 - 4x - 12$

B $x^4 + 3x^3 - 4x^2 - 12x$

C $x^3 + 3x^2 - 4x - 12 + \frac{1}{(x + 1)}$

D $2x^3 + 3x^2 - 4x - 12$

- 13** Using synthetic division to divide this polynomial by this binomial, what is the resulting quotient and remainder?

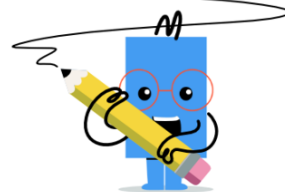
$$\frac{x^5 + 2x^4 - 20x^3 - 30x^2 + 99x + 108}{(x + 1)}$$

A $x^4 + x^3 - 21x^2 - 9x + 108$

B $x^5 + x^4 - 21x^3 - 9x^2 + 108x$

C $2x^4 + x^3 - 21x^2 - 9x + 108$

D $x^4 + x^3 - 21x^2 - 9x + 108 + \frac{1}{(x + 1)}$



Polynomial and Rational Functions

- 14** Using synthetic division to divide this polynomial by this binomial, what is the resulting quotient and remainder? Hint: The quotient's first term is one degree lower than the original polynomial, and the last bottom-row value is the remainder.

$$\begin{array}{r} x^4 - 3x^3 - 3x^2 + 11x - 6 \\ (x - 1) \end{array}$$

A

$$x^4 - 2x^3 - 5x^2 + 6x$$

B

$$x^3 - 2x^2 - 5x + 6$$

C

$$2x^3 - 2x^2 - 5x + 6$$

D

$$x^3 - 2x^2 - 5x + 6 + \frac{1}{(x - 1)}$$

- 15** Using synthetic division to divide this polynomial by this binomial, what is the resulting quotient and remainder?

$$\begin{array}{r} x^3 + 6x^2 + 11x + 6 \\ (x + 3) \end{array}$$

-3	1	6	11	6
		-3	-9	-6
	1	3	2	0

A

$$x^2 + 3x + 2 + \frac{1}{(x + 3)}$$

B

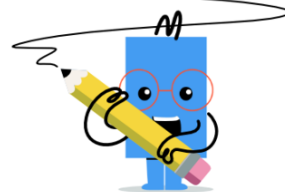
$$2x^2 + 3x + 2$$

C

$$x^2 + 3x + 2$$

D

$$x^3 + 3x^2 + 2x$$



Polynomial and Rational Functions

- 16** Based on the order of polynomials in the numerator and denominator, what type of horizontal or slant asymptotes would this expression have?

$$f(x) = \frac{(x+4)(x-3)(x-4)}{(x+1)}$$

A

Horizontal asymptote (at zero)

B

Slant asymptote

C

Horizontal asymptote (not at zero)

D

No horizontal or slant asymptote

- 17** Is there a hole or a vertical asymptote at $x=-1$ when this polynomial is divided by this binomial?

$$f(x) = \frac{x^2 - 3x - 4}{x^2 - 1}$$

A

Hole

B

Vertical Asymptote

C

Neither

- 18** On which set of open intervals does this polynomial keep a constant sign?

$$x^2 - 16$$

A

$$(-\infty, -4) \cup (-4, 4) \cup (4, \infty)$$

B

$$(-\infty, -4) \cup (-4, -3) \cup (-3, 4) \cup (4, \infty)$$

C

$$(-\infty, -4) \cup (-4, -1) \cup (-1, 4) \cup (4, \infty)$$

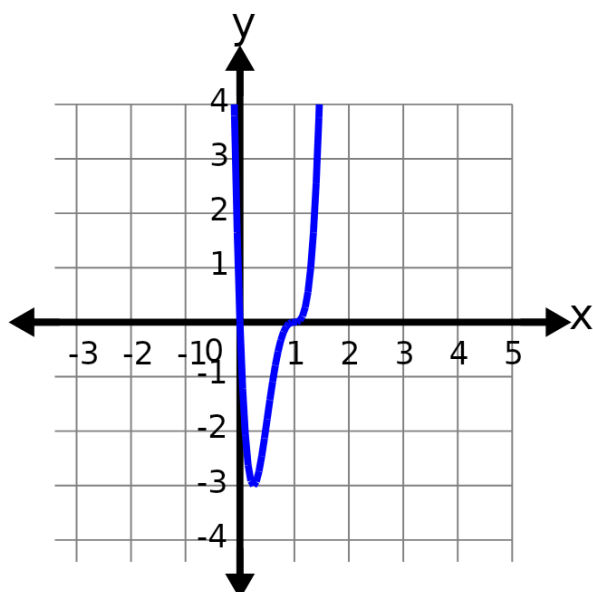
D

$$(-\infty, -4) \cup (-4, -2) \cup (-2, 4) \cup (4, \infty)$$

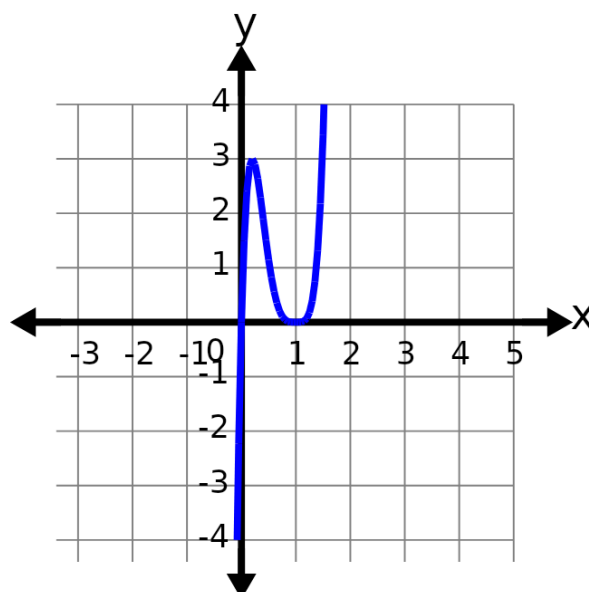
- 19** Which graph shows the x-intercept behaviour of this function?

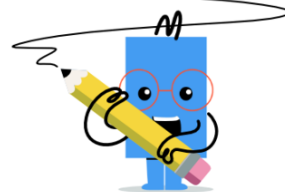
$$f(x) = x(x-1)^3$$

A



B



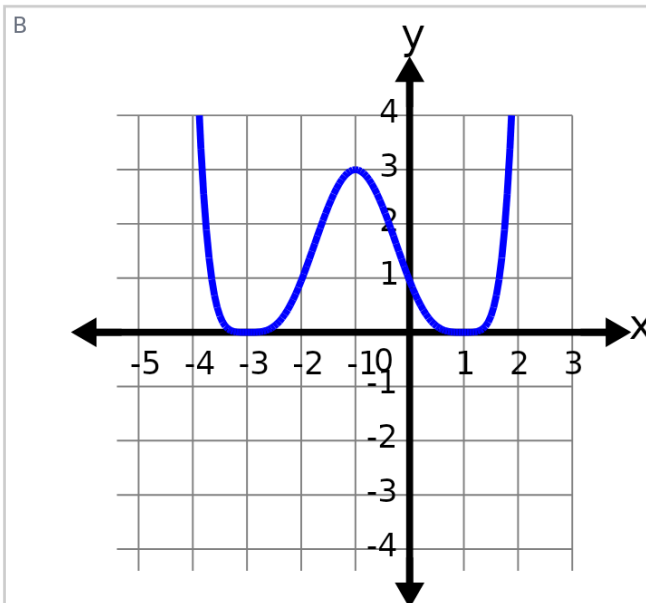
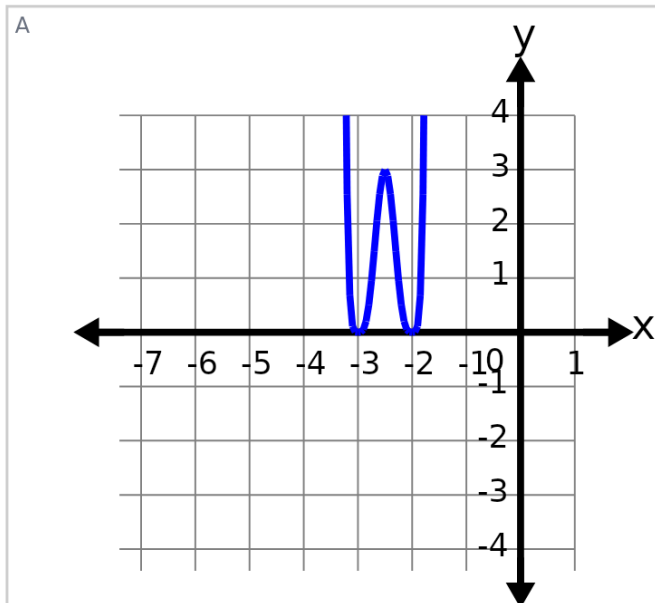


Polynomial and Rational Functions

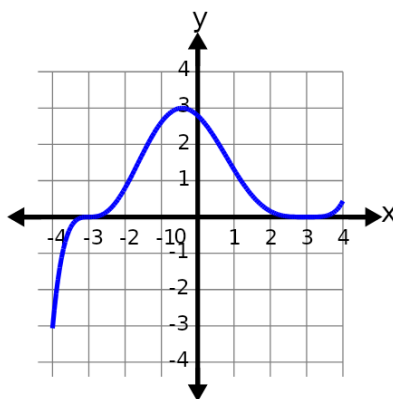
20 Which graph shows these roots and multiplicities?

$$x = -3 \text{ (multiplicity 4)}$$

$$x = -2 \text{ (multiplicity 4)}$$



21 What are the roots and multiplicities shown by this graph?



A

$$x = 3 \text{ (multiplicity 1)}$$
$$x = 4 \text{ (multiplicity 3)}$$

B

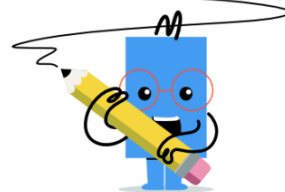
$$x = -3 \text{ (multiplicity 4)}$$
$$x = 3 \text{ (multiplicity 4)}$$

C

$$x = -3 \text{ (multiplicity 4)}$$
$$x = 3 \text{ (multiplicity 3)}$$

D

$$x = -3 \text{ (multiplicity 3)}$$
$$x = 3 \text{ (multiplicity 4)}$$



Polynomial and Rational Functions

22 Which set of values satisfies this inequality?

$$\frac{x^2 - 9}{x + 4} < 0$$

A

$$(-4, -3) \cup (3, \infty)$$

B

$$(-\infty, -4) \cup (-4, -3) \cup (-3, 3) \cup (3, \infty)$$

C

$$(-4, -3) \cup (-2, 3)$$

D

$$(-\infty, -4) \cup (-3, 3)$$

23 Which set of values satisfies this inequality?

$$\frac{(x + 4)(x + 2)(x + 1)}{x + 2} > 0$$

A

$$(-\infty, -4) \cup (-4, -1) \cup (-1, \infty)$$

B

$$(-4, -1)$$

C

$$(-\infty, -4) \cup (-1, \infty)$$

D

$$(-4, -2) \cup (-1, \infty)$$

24 Which set of values satisfies this inequality?

$$\frac{(x + 4)^4(x - 4)^5}{x + 2} < 0$$

A

$$(-2, 4)$$

B

$$(-\infty, -4) \cup (-2, 4)$$

C

$$(-\infty, -2) \cup (-2, 4) \cup (4, \infty)$$

D

$$(-\infty, -2) \cup (4, \infty)$$

25 Which set of values satisfies this inequality?

$$\frac{(x + 1)^3(x - 1)^3(x - 4)^2}{x} < 0$$

A

$$(-1, 0) \cup (1, 4)$$

B

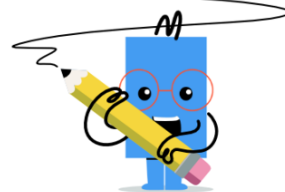
$$(-\infty, -1) \cup (-1, 0) \cup (0, 1) \cup (1, \infty)$$

C

$$(-1, 0) \cup (1, \infty)$$

D

$$(-\infty, -1) \cup (0, 1)$$



Polynomial and Rational Functions

26 Which set of values satisfies this inequality?

$$\frac{(x+2)(x-1)}{x-1} < 0$$

A

$$(-\infty, -2) \cup (-2, \infty)$$

B

$$(-\infty, -2)$$

C

$$(-2, \infty)$$

D

$$(-2, 1)$$

27 Is $(x - 0)$ a factor of $f(x)$?

$$f(x) = x^5 - 2x^4 - 3x^3$$

A

No

B

Yes

28 Which calculation determines whether $(x - 3)$ is a factor of $f(x)$?

$$f(x) = x^4 + 4x^3 + 5x^2 + 2x$$

A

$$f(0) = 3$$

B

$$f(0) = -3$$

C

$$f(-3) = 0$$

D

$$f(3) = 0$$

29 Given that $(x + 1)$ is a factor of $f(x)$, find the value of a .

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

A

2

B

3

C

1

D

-2

30 Given $f(-2) = -75$, find the value of a .

$$f(x) = x^3 - 7x^2 + ax - 9$$

A

14

B

15

C

-15

D

16

31 Use factor theorem and synthetic division to fully factor this polynomial.

$$x^3 + 7x^2 + 14x + 8$$

A

$$(x+4)(x+2)(x+1)$$

B

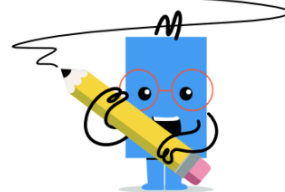
$$(x-1)(x-4)(x+4)$$

C

$$x(x+2)(x+2)$$

D

$$(x-4)(x+3)(x-4)$$



Polynomial and Rational Functions

- 32** Find the remainder when $f(x)$ is divided by $(x - 2)$.

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

A

-12

B

0

C

2

- 33** When $f(x)$ is divided by $(x - 1)$ the remainder is -16. Find the value of a .

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

A

1

B

0

C

2

D

-1

- 34** Use synthetic division to divide this polynomial by this binomial. Is the binomial a factor?

$$\frac{x^4 + 3x^3 - 8x^2 - 12x + 16}{(x + 1)}$$

A

Yes

B

No