

Polynomial Division

Divide using either long division or synthetic division (when possible).

1. $(9x^3 - 2x^2 + 5x + 4) \div (x - 3)$

2. $(6x^3 + 19x^2 + 7x - 12) \div (2x + 3)$.

3. $(12x^3 - 7x^2 - 38x + 35) \div (4x - 5)$

4. $(x^4 + 7x^3 - 6x + 2) \div (x + 4)$

Remainder/Factor Theorem

Determine which are factors of $2x^{91} - x^{90} - 10x^{89}$.

5. $3x + 1$

6. $2x - 5$

7. $x + 2$

Polynomial Vocabulary

Classify each polynomial by the degree and by the number of terms.

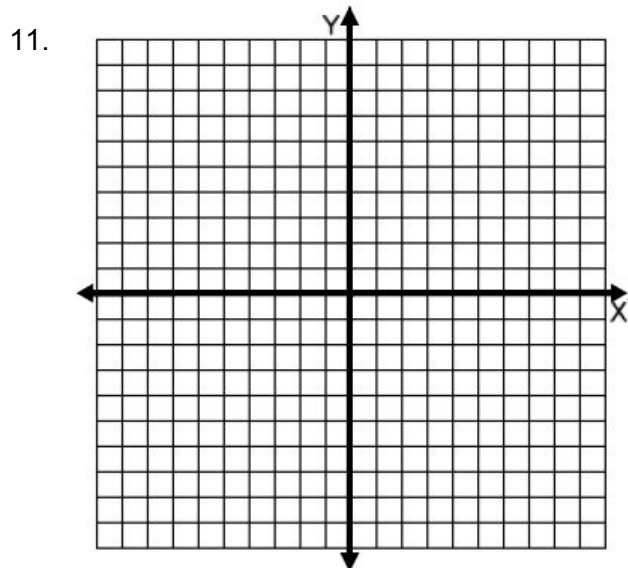
8. $7x^3 - 2x$

9. $-10x^4 - 3x^3 + 2$

10. 7

Zeroes and Multiplicity, Extrema, Intervals for Increasing/Decreasing/Positive/Negative

For each graph and equation, determine all key features.



Zeroes: _____

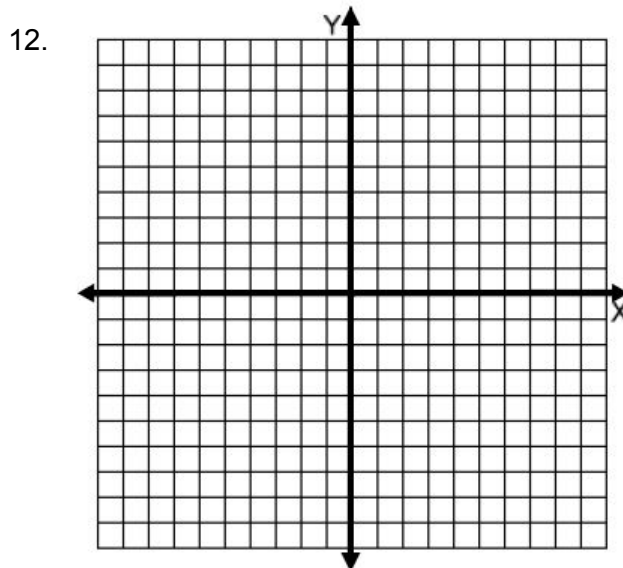
Extrema: _____

Pos/Neg: _____

Inc/Dec: _____

End Behavior: _____

Degree: _____



Zeroes: _____

Extrema: _____

Pos/Neg: _____

Inc/Dec: _____

End Behavior: _____

Degree: _____

13. $y = -2(x + 1)^2(3x - 1)$

Zeroes: _____

Extrema: _____

Pos/Neg: _____

Inc/Dec: _____

End Behavior: _____

Degree: _____

14. $y = x^3(x - 2)(x - 3)$

Zeroes: _____

Extrema: _____

Pos/Neg: _____

Inc/Dec: _____

End Behavior: _____

Degree: _____

Solve Polynomials

Determine all real and complex solutions.

15. $x^3 - 5x^2 + 3x - 15 = 0$

16. $x^4 - 3x^3 - 24x^2 + 80x = 0$

17. $x^3 + 64 = 0$

18. $x^3 + 5x^2 + 10x + 24 = 0$

Applications

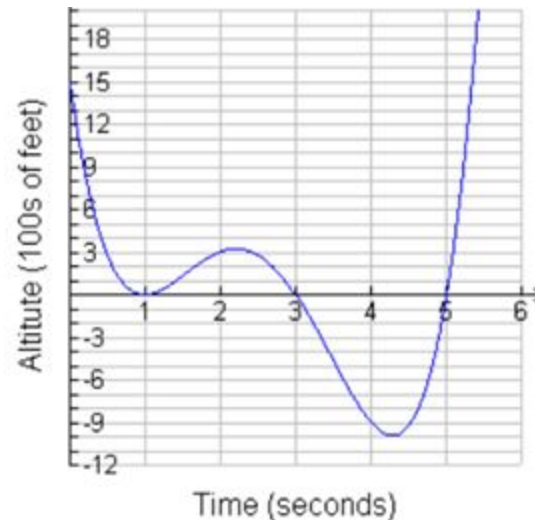
19. The weight of an ideal round-cut diamond can be modeled by $w = 0.0074d^3 - 0.087d^2 + 0.32d$, where w is the diamond's weight (in carats) and d is its diameter (in millimeters). According to the model, what is the weight of a diamond with a diameter of 12 millimeters?

20. The profit P (in millions of dollars) for a t-shirt manufacturer can be modeled by $P = -x^3 + 5x^2 + 9x$, where x is the number of t-shirts produced (in millions). Currently, the company produces 5 million t-shirts and makes a profit of \$45,000,000. What lesser number of t-shirts could the company produce and still make the same profit?

21. A box has a height of $x - 4$ inches and a length of $x + 3$ inches. If the volume of the box is $2x^3 - 3x^2 - 23x + 12$ cubic inches, determine the width of the box.

22. When fighter pilots train for dog-fighting, a “hard-deck” is usually established below which no competitive activity can take place. The polynomial graph given shows Maverick’s altitude (y in 100s of feet) above and below this hard-deck during a 5 second (x) interval.

- What is the lowest possible degree of this polynomial?
- How many total seconds was Maverick above the hard-deck during the first 5 seconds?
- After how many seconds is Maverick 300 feet above the hard-deck?
- Determine the equation of the function in factored form.



Rates of Change

23. Find the average rate of change from $x = -1$ to $x = 3$ for each of the functions below.

a. $a(x) = 2x + 3$

b. $b(x) = x^2 - 2$

c. $c(x) = 2^x - 1$

d. Which function has the greatest average rate of change over the interval $[-1, 3]$?

24. In general as $x \rightarrow \infty$, which function eventually grows at the fastest rate?

a. $a(x) = 3x$

b. $b(x) = x^3$

c. $c(x) = 3^x$