

1. Find all real solutions.

(a) $4x + 3 = 4x^2$

(b) $\sqrt{2x - 3} + x = 3$

(c) $|4x + 1| = 13$

2. Write in $a + bi$ format:

(a) $\frac{2 - 3i}{2 + 5i}$ (b) $(3 - 4i)^2$ (c) i^{99}

3. Find all complex solutions (including real):

$$x^4 - 256 = 0$$

4. Solve the inequality.

(a) $-x^2 - 4x + 12 > 0$

(b) $|x - 5| \leq 3$

5. Consider the points $(-6, 2)$ and $(4, -14)$.

(a) Find the distance between them.

(b) Find the midpoint.

6. Find the center and radius of the circle:

$$x^2 + y^2 + 2x - 6y + 9 = 0$$

7. Test the equation for symmetry.

(a) $y = \sqrt{1 - x^2}$ (b) $y = \frac{x}{4 - x^2}$

(c) $|y| + x = 0$

8. Find the equation of the line parallel to $7x - 2y = 8$ and passing through the point $(-4, 3)$.

9. Suppose that M varies directly as z , and $M = 120$ when $z = 15$. Find z when $M = 150$.

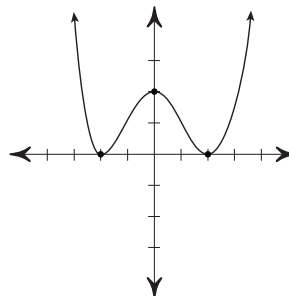
10. Find the domain of the function.

(a) $f(x) = \sqrt{x - 4}$ (b) $g(x) = \frac{x^2}{x^3 - 8}$

11. Sketch the graph of the function and state the domain and range.

$$g(x) = \begin{cases} -\frac{1}{2}x + 2 & x < -2 \\ x^2 - 2 & x \geq -2 \end{cases}$$

12. The graph of f shown below, passes through the points $(-2, 0)$, $(0, 2)$, and $(2, 0)$. Sketch the graph of $g(x) = -\frac{1}{2}f(x - 1)$.



13. A right triangle has one vertex on the graph of $y = 9 - x^2$, $x > 0$, at (x, y) , another at the origin, and the third on the positive x -axis at $(x, 0)$. Express the area A of the triangle as a function of x .

14. Find the average rate of change of the function between the given x values.

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

15. Use your graphing calculator to determine the intervals on which the graph of the function is increasing and decreasing.

$$h(x) = x^3 + \frac{5}{2}x^2 - 2x + 3$$

16. Suppose the graph of f passes through the point $(-2, 3)$.

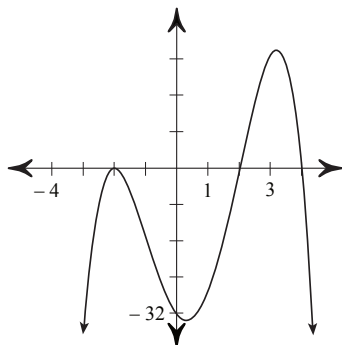
(a) If f is an odd function, what other point must it pass through?

(b) If f is an even function, what other point must it pass through?

17. Write the following quadratic function in standard form and find the minimum or maximum value.

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

18. Write a polynomial function whose graph is shown below (use the smallest degree possible).



19. Divide $4x^3 - 7x + 5$ by $2x - 1$.

20. Consider $f(x) = \frac{x^2 - 2x - 3}{x^2 - 1}$

- List all x - and y -intercepts
- State the domain of f
- Where is the vertical asymptote(s)?
- Are there any holes? If so, give the coordinates.
- What is the horizontal or oblique asymptote?
- Sketch the graph of $y = f(x)$.

21. Consider $f(x) = \frac{x^2 - 1}{x - 2}$

- List all x - and y -intercepts
- State the domain of f
- Where is the vertical asymptote(s)?
- Are there any holes? If so, give the coordinates.
- What is the horizontal or oblique asymptote?
- Sketch the graph of $y = f(x)$.

22. Solve the inequalities.

(a) $x^2(x - 2)(x + 4) < 0$

(b) $\frac{1}{x + 3} + \frac{1}{x - 2} \geq 0$

23. Find all complex zeros of $h(x)$.

$$h(x) = x^3 - 7x^2 + 12x - 10$$

24. Consider the function:

$$f(x) = 2x^3 - 5x^2 - 9x + 18$$

- List all possible zeros.
 - Use Descartes' Law of Signs to find the possible number of positive and negative zeros.
 - Factor f completely.
 - Find all of the zeros.
25. Find a 4th degree polynomial with zeros $-2i$ and 1 , with 1 having multiplicity 2.

Answers

1. (a) $-\frac{1}{2}, \frac{3}{2}$; (b) 2; (c) $-\frac{7}{2}, 3$

2. (a) $-\frac{11}{29} - \frac{16}{29}i$; (b) $-7 - 24i$; (c) $-i$

3. $\pm 4, \pm 4i$

4. (a) $(-6, 2)$; (b) $[2, 8]$

5. (a) $2\sqrt{89}$; (b) $(-1, -6)$

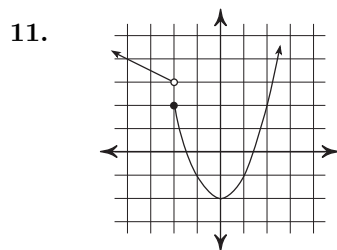
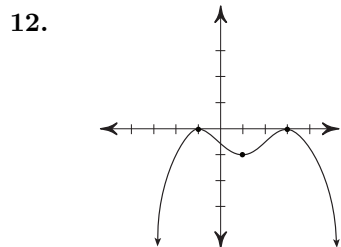
6. center: $(-1, 3)$, $r = 1$

7. (a) y -axis; (b) origin; (c) x -axis

8. $y = \frac{7}{2}x + 17$

9. $\frac{75}{4}$

10. (a) $[4, \infty)$; (b) $(-\infty, 2) \cup (2, \infty)$

domain: $(-\infty, \infty)$; range: $[-2, \infty)$ 

13. $A(x) = \frac{1}{2}(9x - x^3)$

14. $-\frac{1}{10}$

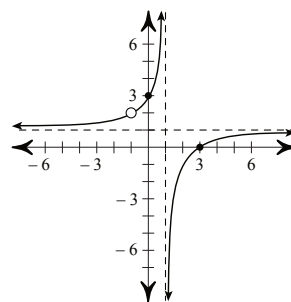
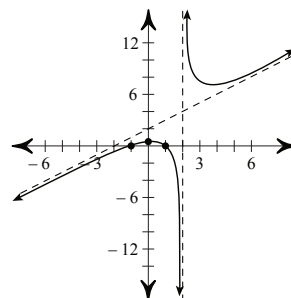
15. increasing on $(-\infty, -2) \cup (\frac{1}{3}, \infty)$, decreasing on $(-2, \frac{1}{3})$

16. (a) $(2, -3)$; (b) $(2, 3)$

17. $f(x) = -3(x - 1)^2 - 2$, vertex: $(1, -2)$, maximum: -2

18. $g(x) = -(x - 4)(x + 2)^2(x - 2)$

19. $2x^2 + x - 3 + \frac{2}{2x - 1}$

20. (a) x -int: $(3, 0)$, y -int: $(0, 3)$; (b) $\{x \mid x \neq -1, x \neq 1\}$; (c) $x = 1$; (d) $(-1, 2)$; (e) HA: $y = 1$;21. (a) x -int: $(-1, 0)$ and $(1, 0)$, y -int: $(0, \frac{1}{2})$; (b) $\{x \mid x \neq 2\}$; (c) $x = 2$; (d) no holes; (e) OA: $y = x + 2$;

22. (a) $(-4, 0) \cup (0, 2)$

(b) $(-3, -\frac{1}{2}] \cup (2, \infty)$

23. $\{5, 1 \pm i\}$

24. (a) $\pm\frac{1}{2}, \pm 1, \pm\frac{3}{2}, \pm 2, \pm 3, \pm\frac{9}{2}, \pm 6, \pm 9, \pm 18$

(b) two or zero positive, one negative

(c) $f(x) = (2x - 3)(x + 2)(x - 3)$

(d) $\{-2, \frac{3}{2}, 3\}$

25. $f(x) = x^4 - 2x^3 + 5x^2 - 8x + 4$