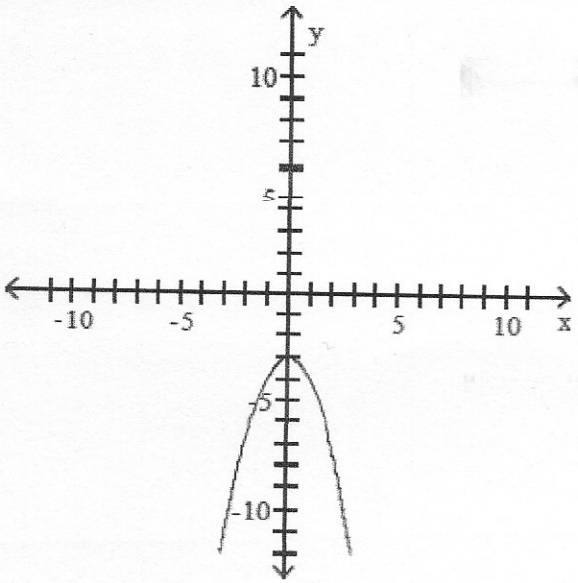
Q1. Find the vertex and axis of symmetry of the graph of the function $f(x) = x^2 - 10x$.

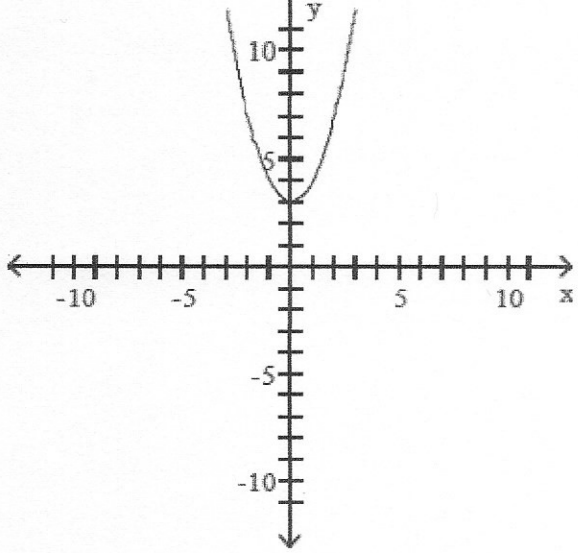
- a. (-5, 25); x = -5
- b. (25, -5); x = 25
- c. (-25, 5); x = -25
- d. (5, -25); x = 5

Q2. Graph the function $f(x) = -x^2 + 3$ by starting with the graph of $y = x^2$ and using transformations (shifting, compressing, stretching, and/or reflection).

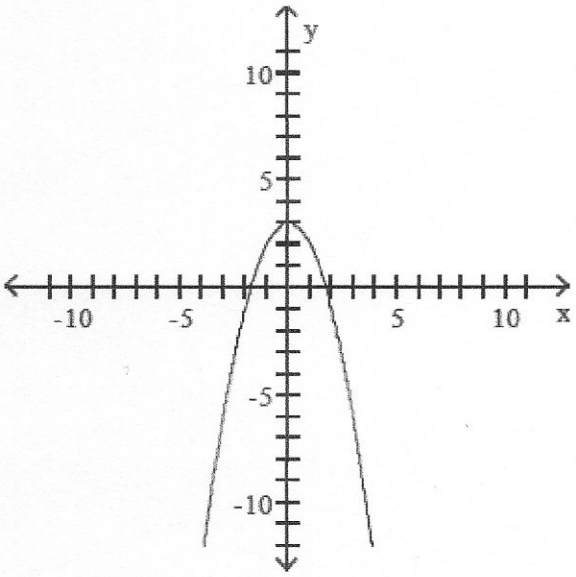
a.



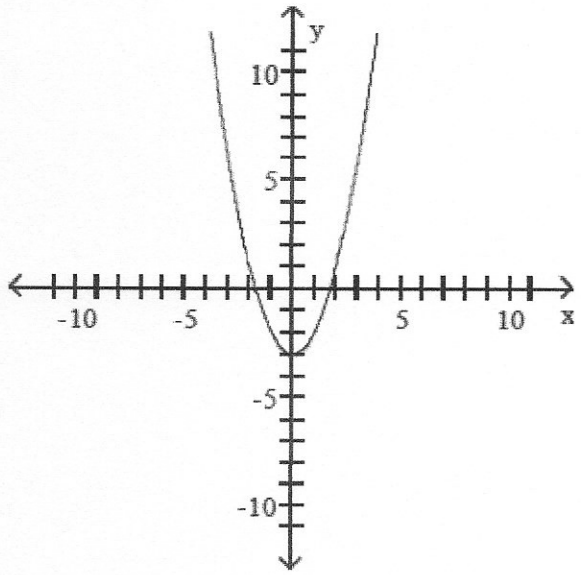
○ b.



○ c.



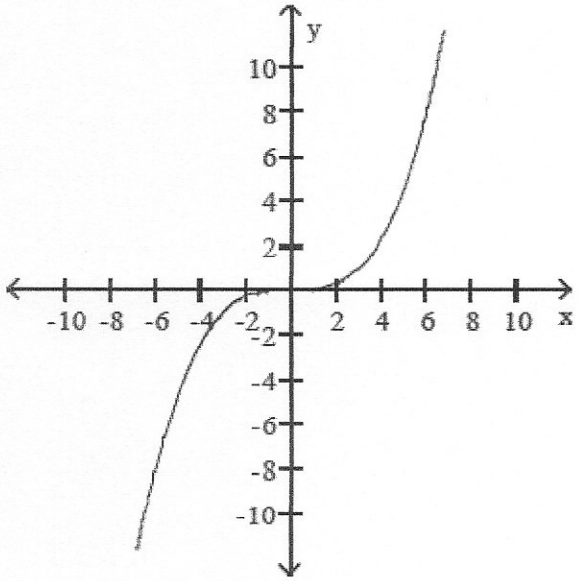
○ d.



Q3. Determine, without graphing, whether the quadratic function $f(x) = x^2 + 2x - 6$ has a maximum value or a minimum value and then find that value.

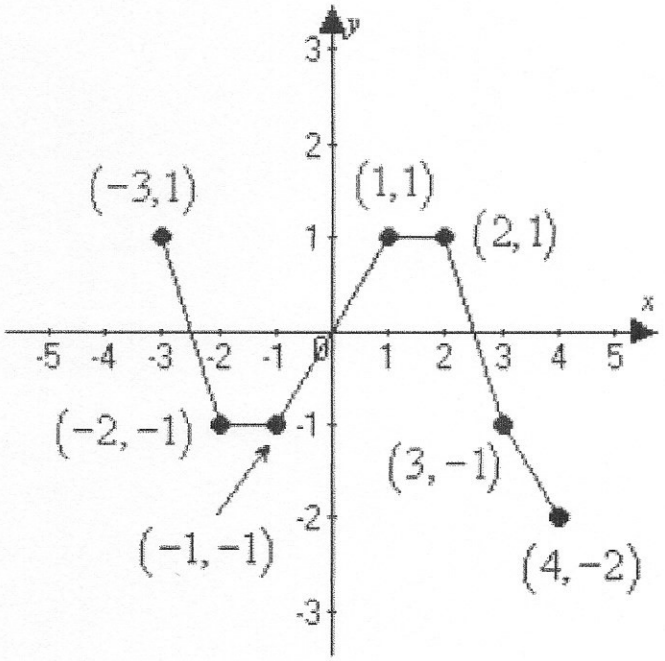
○ a. minimum; -7
○ b. minimum; -1
○ c. maximum; -1
○ d. maximum; -7

Q4. The graph of a function is given. Decide whether it is even, odd, or neither.



○ a. even
○ b. odd
○ c. neither

Q5. Use the graph to find the intervals on which it is increasing, decreasing, or constant.



- a. Increasing on (-3, -2) and (2, 4); decreasing on (-1, 1); constant on (-2, -1) and (1, 2)
- b. Decreasing on (-3, -2) and (2, 4); increasing on (-1, 1); constant on (-2, -1) and (1, 2)
- c. Decreasing on (-3, -2) and (2, 4); increasing on (-1, 1)
- d. Decreasing on (-3, -1) and (1, 4); increasing on (-2, 1)

Q6. Determine the slope and y-intercept of the function F(x) = x/4.

- a. m = 0; b = 1/4
- b. m = 1/4; b = 0
- c. m = 4; b =0
- d. m = -1/4; b = 0

Q7. Find the average rate of change for the function f(x) = 3/(x - 2) from the values 4 to 7.

- a. 7
- b. 1/3
- c. -3/10
- d. 2

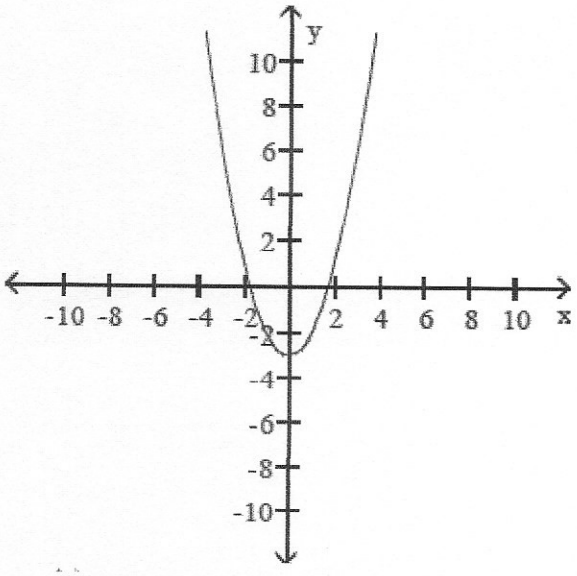
Q8. Determine where the function $f(x) = -x^2 + 8x - 7$ is increasing and where it is decreasing.

- a. increasing on (4, ∞) and decreasing on (-∞, 4)
- b. increasing on (-∞, 4) and decreasing on (4, ∞)
- c. increasing on (9, ∞) and decreasing on (-∞, 9)
- d. increasing on (-∞, 9) and decreasing on (9, ∞)

Q9. Find the average rate of change for the function $f(x) = -3x^2 - x$ from the values 5 to 6.

- a. 1/2
- b. -2
- c. -34
- d. -1/6

Q10. The graph of a function is given. Decide whether it is even, odd, or neither.

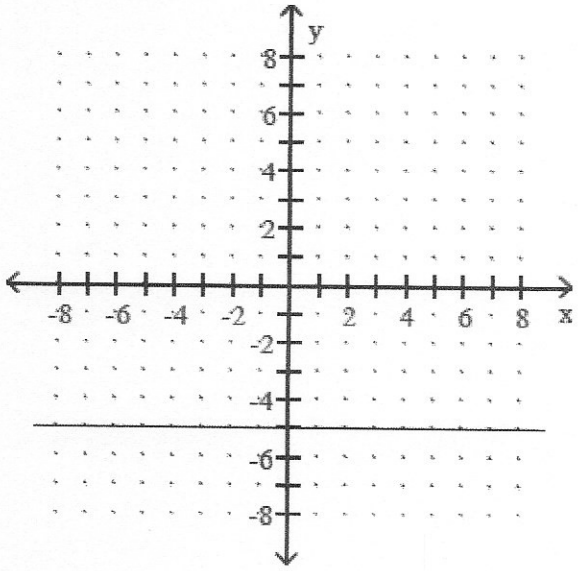


- ○ a. even
- ○ b. odd
- ○ c. neither

Q11. Graph the function F(x) = -5. State whether it is increasing, decreasing, or constant.

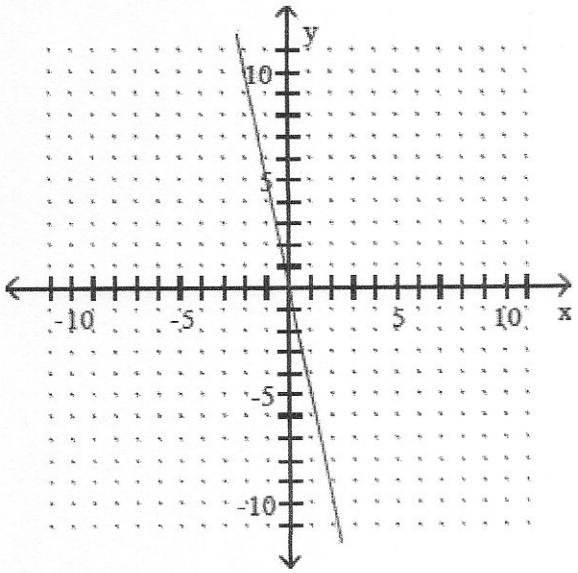
constant

○ a.



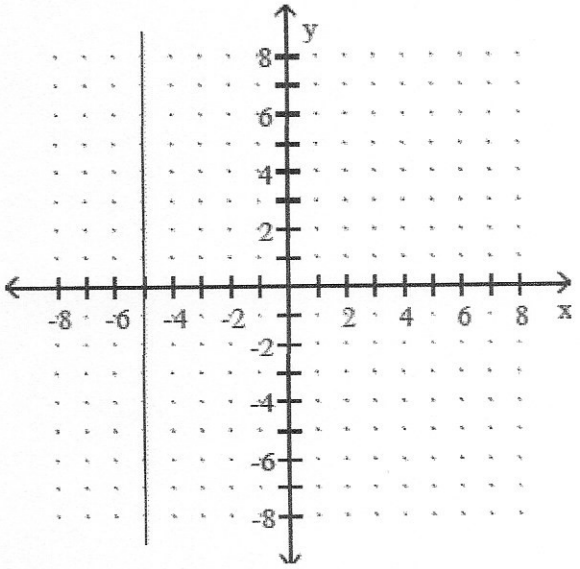
decreasing

○ b.



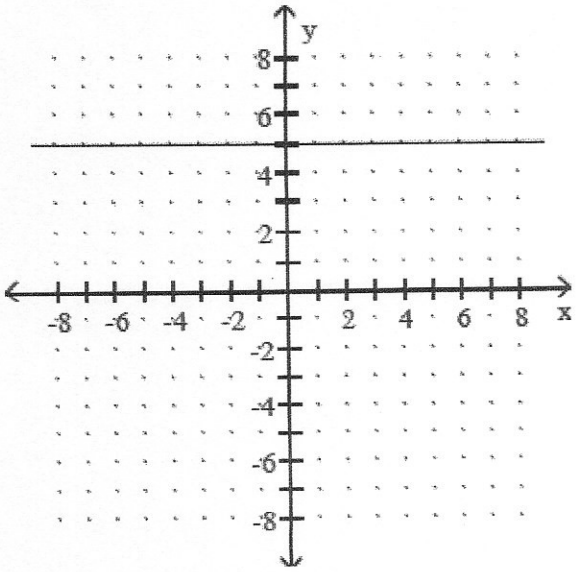
constant

○ c.

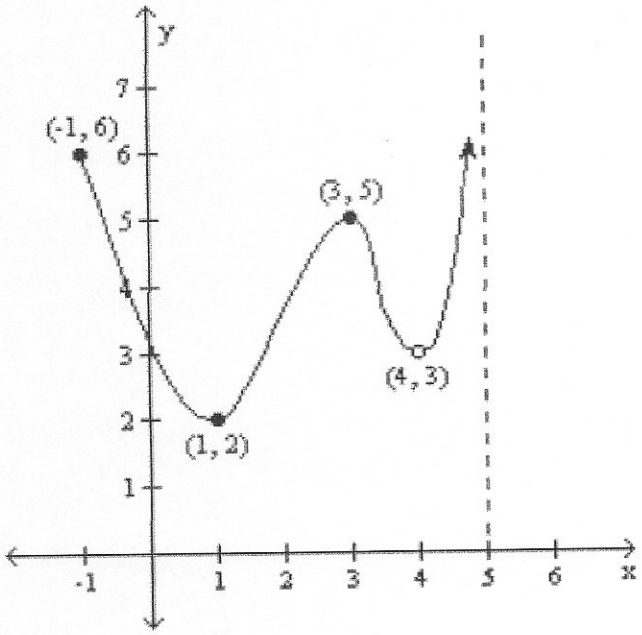


constant

○ d.



Q12. For the graph of the function y = f(x), find the absolute maximum and the absolute minimum, if it exists.



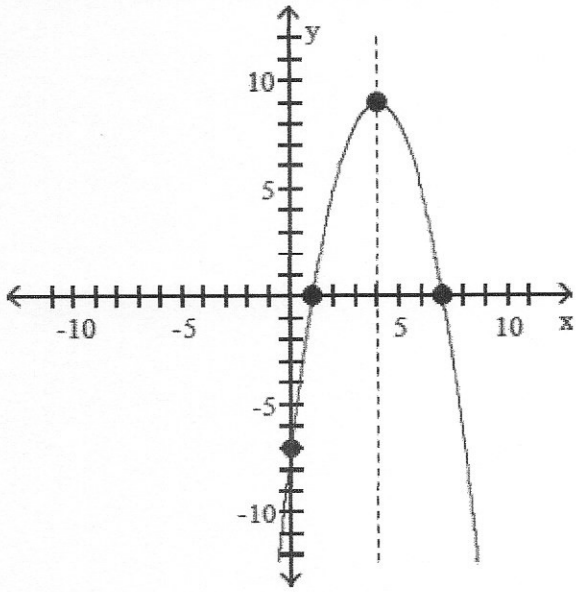
○ a. Absolute maximum: f(-1) = 6; Absolute minimum: f(1) = 2
○ b. Absolute maximum: f(3) = 5; Absolute minimum: f(1) = 2
○ c. Absolute maximum: none; Absolute minimum: none
○ d. Absolute maximum: none; Absolute minimum: f(1) = 2

Q13. Graph the function $f(x) = x^2 + 8x + 7$ using its vertex, axis of symmetry, and intercepts.

○ a.

vertex (4, 9)

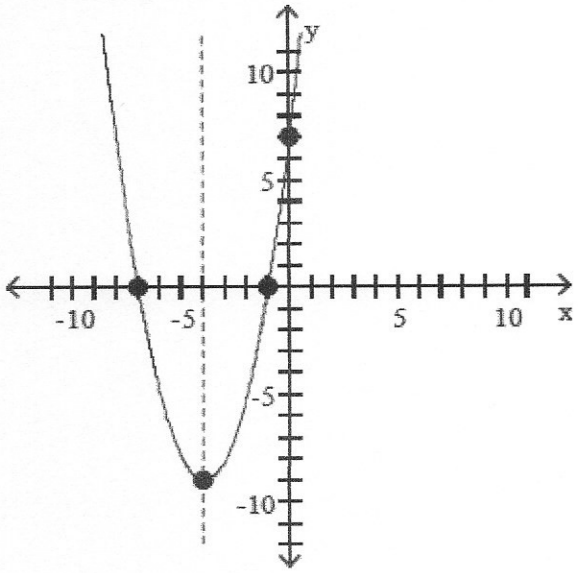
intercepts (1, 0), (7, 0), (0, –7)



○ b.

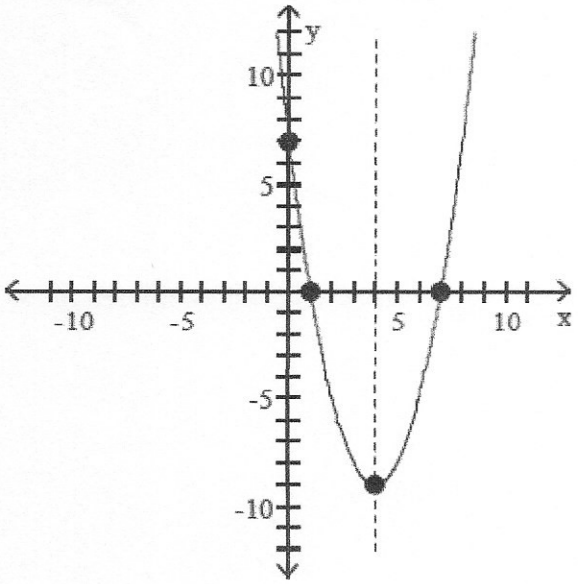
vertex (–4, –9)

intercepts (–1, 0), (– 7, 0), (0, 7)



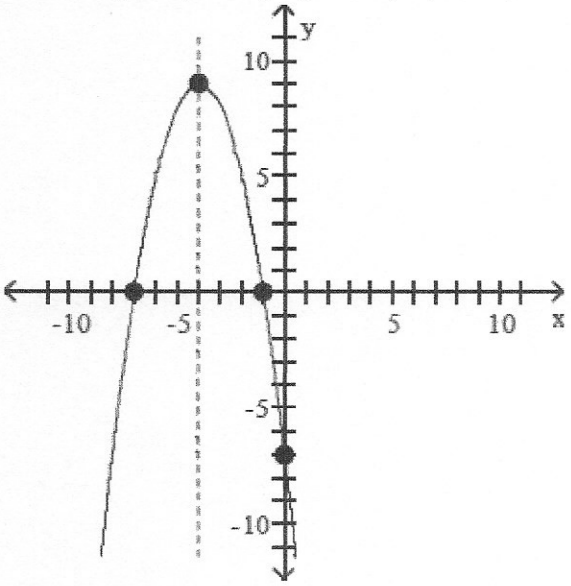
vertex (4, –9)
intercepts (1, 0), (7, 0), (0, 7)

○ c.

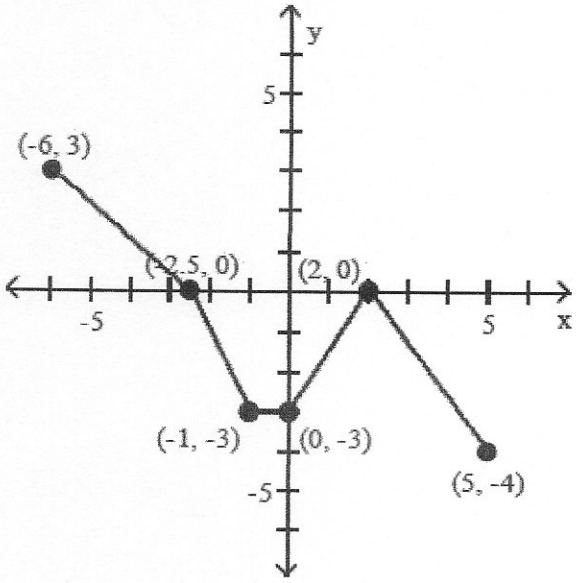


vertex (–4, 9)
intercepts (–1, 0), (– 7, 0), (0, –7)

○ d.



Q14. The graph of a function is given. Determine whether the function is increasing, decreasing, or constant on the interval (-6, -2.5).



- a. increasing
- b. decreasing
- c. constant

Q15. In a certain city, the cost of a taxi ride is computed as follows: There is a fixed charge of $2.90 as soon as you get in the taxi, to which a charge of $1.70 per mile is added. Find an equation that can be used to determine the cost, C(x), of an x-mile taxi ride.

- a. C(x) = 1.70 + 2.90x
- b. C(x) = 3.10x
- c. C(x) = 4.60x
- d. C(x) = 2.90 + 1.70x

Q16. Determine whether the relation represents a function. If it is a function, state the domain and range.
{(-4, 17), (-3, 10), (0, 1), (3, 10), (5, 26)}

- a. It is a function; domain: {17, 10, 1, 26}; range: {-4, -3, 0, 3, 5}
- b. It is a function; domain: {-4, -3, 0, 3, 5}; range: {17, 10, 1, 26}
- c. It is NOT a function.

Q17. Determine the average rate of change for the function p(x) = -x + 3.

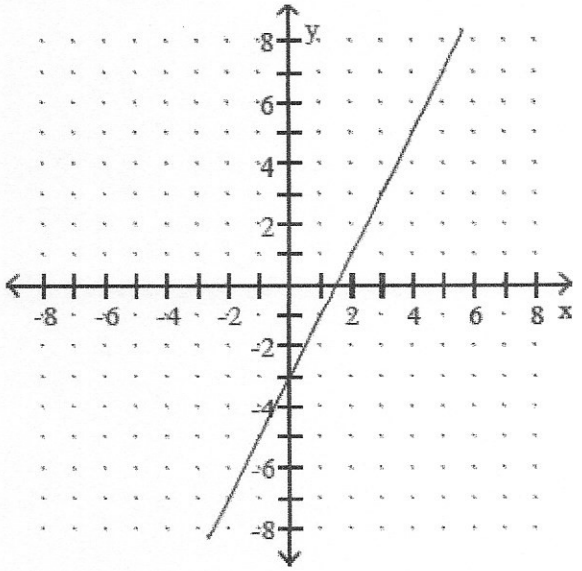
- a. 3
- b. -3
- c. -1
- d. 1

Q18. Find (f - g)(4) when $f(x) = 5x^2 + 6$ and g(x) = x + 2.

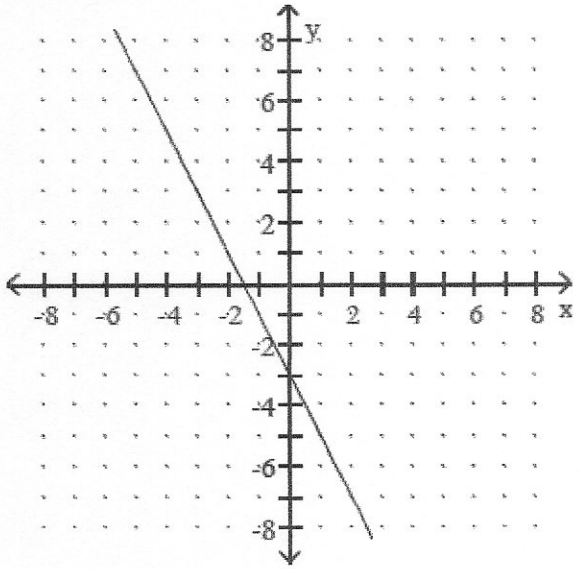
- a. 80
- b. 88
- c. 84
- d. -90

Q19. Graph the function h(x) = -2x + 3. State whether it is increasing, decreasing, or constant.

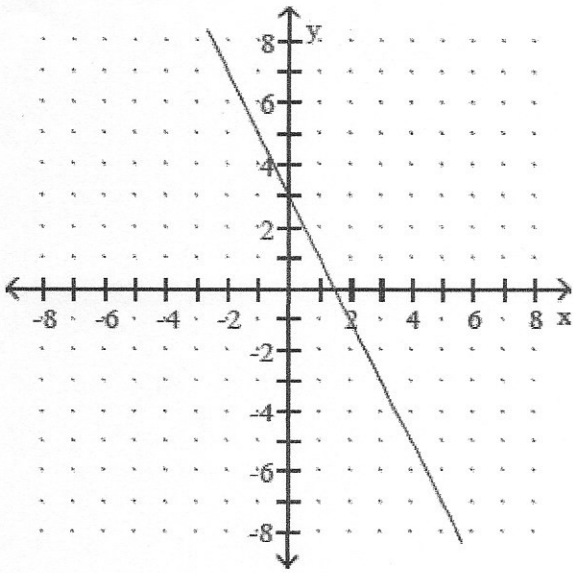
○ a. increasing



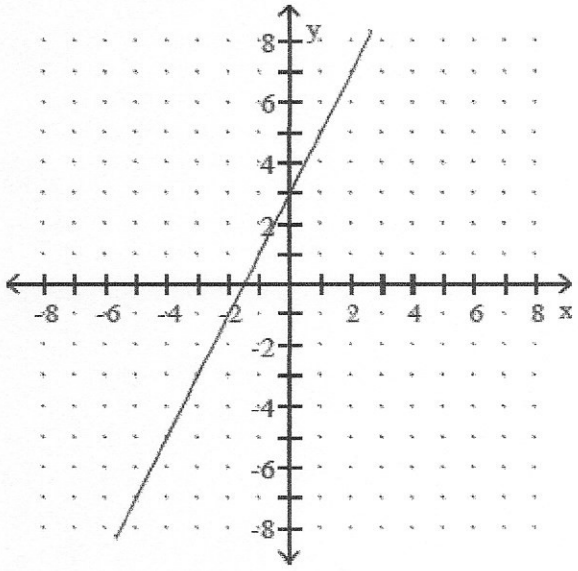
○ b. decreasing



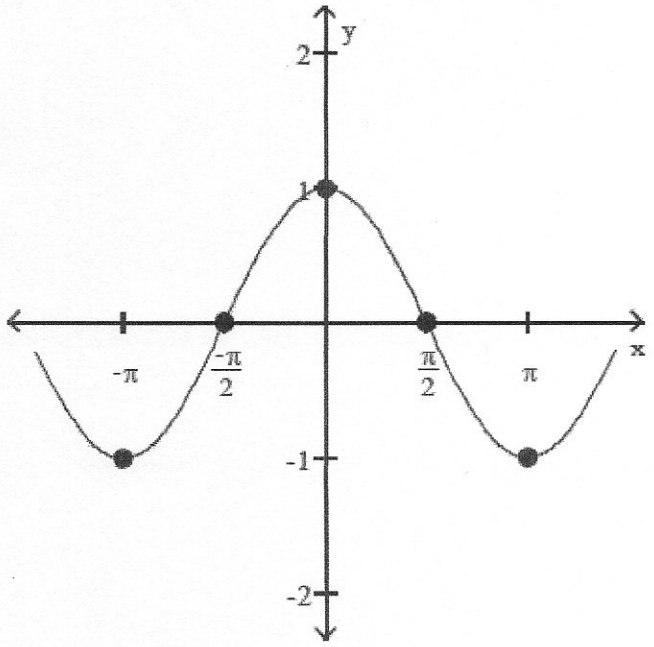
○ c. decreasing



○ d. increasing



Q20. The graph of a function f is given. Find the numbers, if any, at which f has a local maximum. What are the local maxima?



- ○ a. f has no local maximum
- ○ b. f has a local maximum at -π; the local maximum is 1
- ○ c. f has a local maximum at x = 0; the local maximum is 1
- ○ d. f has a local maximum at x = -π and π; the local maximum is -1

Q21. State whether the function f(x) = x(x - 9) is a polynomial function or not. If it is, give its degree. If it is not, tell why not.

- ○ a. Yes; degree 2
- ○ b. No; it is a product
- ○ c. Yes; degree 0
- ○ d. Yes; degree 1

Q22. Find the intercepts of the function $f(x) = x^3 + 3x^2 - 4x - 12$.

- ○ a. x-intercepts: -2, 2, 3; y-intercept: -12
- ○ b. x-intercepts: -3, -2, 2; y-intercept: -12
- ○ c. x-intercept: -3; y-intercept: -12
- ○ d. x-intercept: -2; y-intercept: -12

Q23. Find the real solutions of the equation $3x^3 - x^2 + 3x - 1 = 0$.

- ○ a. {-3, 1/3, -1}
- ○ b. {1/3}
- ○ c. {1/3, -1}
- ○ d. {-3, -1/3, -1}

Q24. A polynomial f(x) of degree 3 whose coefficients are real numbers has the zeros -4 and 4 - 5i. Find the remaining zeros of f.

- ○ a. 4, -4 + 5i
- ○ b. 4, 4 + 5i
- ○ c. 4 + 5i
- ○ d. -4 + 5i

Q25. List the potential rational zeros of the polynomial function $f(x) = x^5 - 6x^2 + 5x + 15$. Do not find the zeros.

○ a. ± 1, ± 1/5, ± 1/3 ± 1/15
○ b. ± 1, ± 5, ± 3, ± 15
○ c. ± 1, ± 5, ± 3
○ d. ± 1, ± 1/5, ± 1/3, ± 1/15, ± 5, ± 3,± 15

Q26. Find the real solutions of the equation $x^4 - 8x^3 + 16x^2 + 8x - 17 = 0$.
○ a. {-1, 1}
○ b. {-1, 4}
○ c. {-4, 4}
○ d. {-4, 1}

Q27. Use the Factor Theorem to determine whether x + 5 is a factor of $f(x) = 3x^3 + 13x^2 - 9x + 5$.
○ a. Yes
○ b. No

Q28. Find a bound on the real zeros of the polynomial function $f(x) = x^4 - 8x^2 - 9$.
○ a. -17 and 17
○ b. -9 and 9
○ c. -18 and 18
○ d. -10 and 10

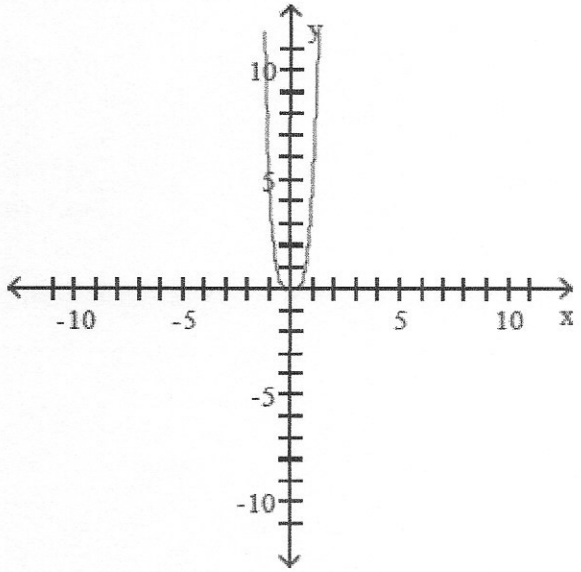
Q29. Find the intercepts of the function $f(x) = 4x^5(x + 3)^3$.
○ a. x-intercepts: 0, -3; y-intercept: 0
○ b. x-intercepts: 0, 3; y-intercept: 4
○ c. x-intercepts: 0, 3; y-intercept: 0
○ d. x-intercepts: 0, -3; y-intercept: 4

Q30. Form a polynomial f(x) with real coefficients of degree 3 and the zeros 1 + i and -10.
○ a. $f(x) = x^3 - 10x^2 - 18x - 12$
○ b. $f(x) = x^3 + 8x^2 + 20x - 18$
○ c. $f(x) = x^3 + x^2 - 18x + 20$
○ d. $f(x) = x^3 + 8x^2 - 18x + 20$

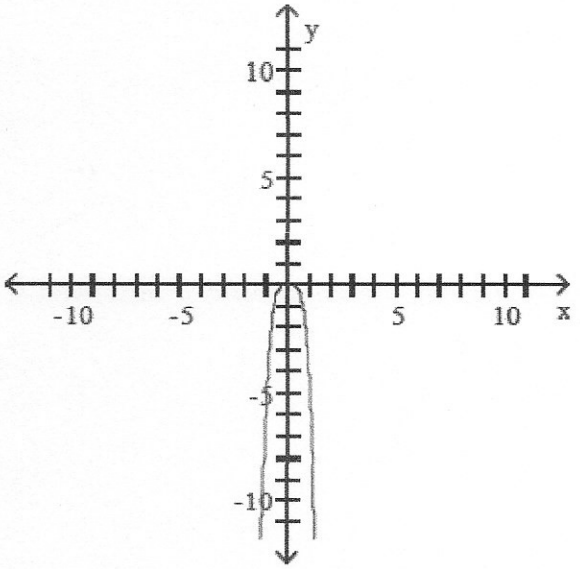
Q31. Find the power function that the graph of $f(x) = (x + 4)^2$ resembles for large values of |x|.
○ a. $y = x^8$
○ b. $y = x^2$
○ c. $y = x^4$
○ d. $y = x^{16}$

Q32. Use transformations of the graph of $y = x^4$ to graph the function $f(x) = 5x^4$.

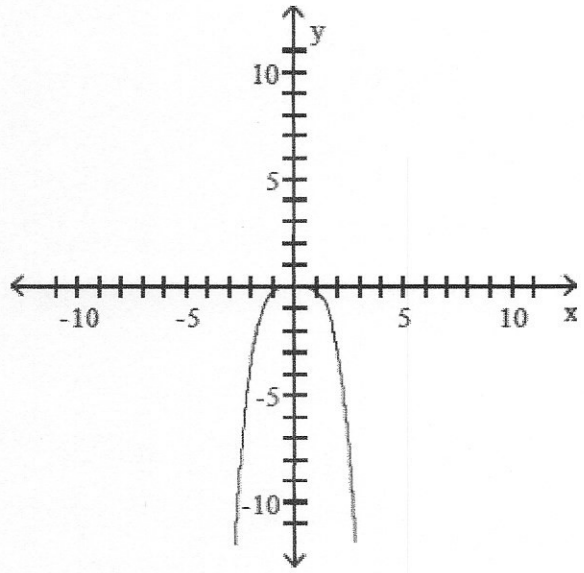
○ a.



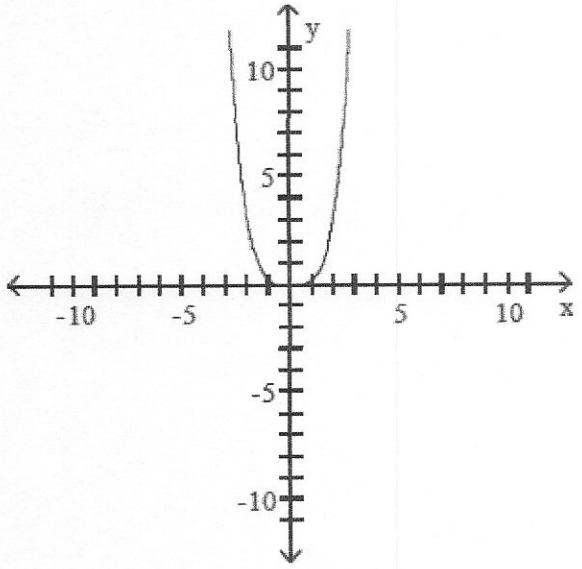
○ b.



c.



d.



Q33. For the polynomial $f(x) = (1/5)x(x^2 - 5)$, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x-axis at each x-intercept.

- a. 0, multiplicity 1, touches x-axis; $\sqrt{5}$, multiplicity 1, touches x-axis; $-\sqrt{5}$, multiplicity 1, touches x-axis
- b. 0, multiplicity 1, crosses x-axis; $\sqrt{5}$, multiplicity 1, crosses x-axis; $-\sqrt{5}$, multiplicity 1, crosses x-axis
- c. $\sqrt{5}$, multiplicity 1, touches x-axis; $-\sqrt{5}$, multiplicity 1, touches x-axis
- d. 0, multiplicity 1

Q34. Solve the inequality algebraically. Express the solution in interval notation.
$(x - 2)^2(x + 9) < 0$

- a. $(-\infty, -9)$ or $(9, \infty)$
- b. $(-\infty, -9]$
- c. $(-\infty, -9)$
- d. $(-9, \infty)$

Q35. Use the Intermediate Value Theorem to determine whether the polynomial function $f(x) = -4x^4 - 9x^2 + 4$; has a zero in the interval [-1, 0].

○ a. f(-1) = -9 and f(0) = -4; no
○ b. f(-1) = 9 and f(0) = 5; no
○ c. f(-1) = 9 and f(0) = -4; yes
○ d. f(-1) = -9 and f(0) = 4; yes

Q36. For the polynomial $f(x) = 4(x - 5)(x - 6)^3$, list each real zero and its multiplicity. Determine whether the graph crosses or touches the x-axis at each x-intercept.

○ a. 5, multiplicity 1, touches x-axis; 6, multiplicity 3
○ b. -5, multiplicity 1, touches x-axis; -6, multiplicity 3
○ c. 5, multiplicity 1, crosses x-axis; 6, multiplicity 3, crosses x-axis
○ d. -5, multiplicity 1, crosses x-axis; -6, multiplicity 3, crosses x-axis

Q37. Solve the inequality algebraically. Express the solution in interval notation.
$(x - 6)/(x + 3) > 0$

○ a. $(-\infty, -3) \cup (6, \infty)$
○ b. $(-\infty, -3)$
○ c. $(6, \infty)$
○ d. $(-3, 6)$

Q38. Find all zeros of the function $f(x) = 2x^4 + 3x^3 + 16x^2 + 27x - 18$ and write the polynomial as a product of linear factors.

○ a. $f(x) = (2x - 1)(x + 2)(x + 3)(x - 3)$
○ b. $f(x) = (2x + 1)(x - 2)(x + 3)(x - 3)$
○ c. $f(x) = (2x - 1)(x + 2)(x + 3i)(x - 3i)$
○ d. $f(x) = (2x + 1)(x - 2)(x + 3i)(x - 3i)$

Q39. Give the equation of the horizontal asymptote, if any, of the function $f(x) = (x^2 - 5)/(25x - x^4)$.

○ a. $y = -1$
○ b. no horizontal asymptotes
○ c. $y = 0$
○ d. $y = -5, y = 5$

Q40. Find the domain of the rational function $R(x) = (-3x^2)/(x^2 + 2x - 15)$.

○ a. $\{x|x \neq 5, 3\}$
○ b. $\{x|x \neq 5, -3\}$
○ c. $\{x|x \neq -15, 1\}$
○ d. $\{x|x \neq -5, 3\}$