

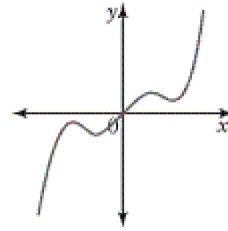
- The degree of the polynomial function $y = x^3 - 2x^2 + 5x - 1$ is
a. 3 b. 4 c. 5 d. 6
- The table of values represents a polynomial function.

x	y
-3	-7
-2	2
-1	-3
0	0
1	3
2	-2
3	7

The function appears to be

- not symmetric
- symmetric about the x -axis
- symmetric about the y -axis
- symmetric about the origin

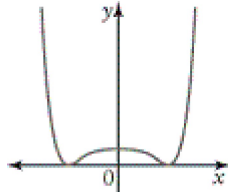
- The least possible degree of the polynomial function represented by the graph shown is



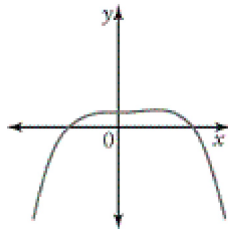
- 3 b. 4 c. 5 d. 7
- If the graph of the function $y = x^3$ is compressed horizontally by a factor of $\frac{1}{2}$, stretched vertically by a factor of 3, and translated 5 units to the left, an equation for the graph of the transformed function is

- $y = 3 \left[\frac{1}{2}(x+5) \right]^3$
- $y = 3 [2(x-5)]^3$
- $y = 6(x+5)^3$
- $y = 24(x+5)^3$

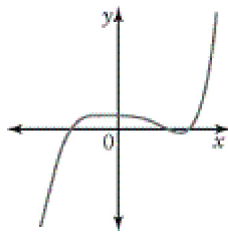
5. Which of the following graphs represents the function $y = 2x^6 - 3x^4 + 1$?



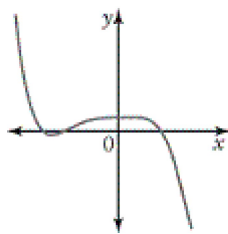
a.



b.



c.

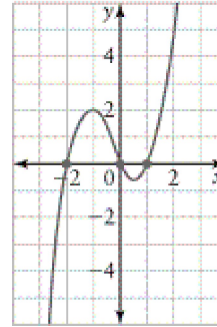


d.

6. Given the function $y = -3x^2 - 5x + 1$, the second differences will all equal

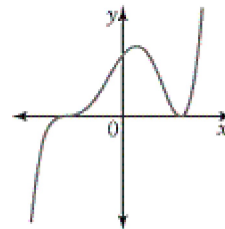
- a. 3 b. -3 c. 6 d. -6

7. State the intervals for which the graph of the function is positive.



- a. $x \in (-\infty, 2)$ and $x \in (1, \infty)$
 b. $x \in (-\infty, 2)$ and $x \in (0, 1)$
 c. $x \in (-2, 0)$ and $x \in (1, \infty)$
 d. $x \in (-\infty, 0)$ and $x \in (1, \infty)$

8. The graph represents a polynomial function of at least degree



- a. 3 b. 4 c. 5 d. 7

9. A factor of $x^3 - 5x^2 - 8x + 12$ is

- a. 1 b. 8 c. $x - 1$ d. $x - 8$

10. Which of the following binomials is a factor of $8x^3 - 4x^2 - 2x + 1$?
- a. $x - 1$ b. $x + 2$ c. $2x + 1$
d. $5x + 1$
11. Determine the approximate degree measure for an angle of 1.32 radians.
- a. 136.4° b. 4.2° c. 75.6°
d. 2.4°

12. Determine the exact value of $\csc \frac{\pi}{4}$.
- a. $\frac{1}{\sqrt{2}}$ b. $\sqrt{2}$ c. $\frac{\sqrt{3}}{2}$ d. $\frac{1}{2}$

13. Determine the exact value of $\cot \frac{5\pi}{3}$.
- a. $\frac{1}{\sqrt{3}}$ b. $\sqrt{3}$ c. $-\frac{1}{\sqrt{3}}$ d. $\frac{1}{2}$

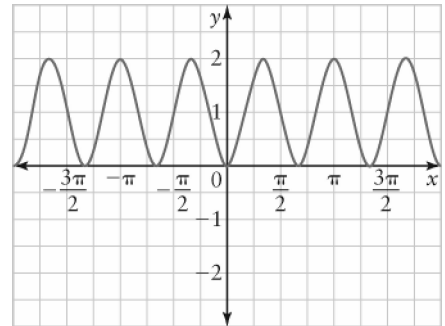
14. Determine the exact value of $\cot \pi$.
- a. 0 b. -1 c. 1
d. undefined

15. Determine the exact value of $\csc \frac{\pi}{2}$.
- a. 0 b. -1 c. 1
d. undefined

16. Use your calculator to determine the value of $\sin 3.11$, to three decimal places.
- a. 0.031 b. 0.054 c. 0.032
d. 0.005

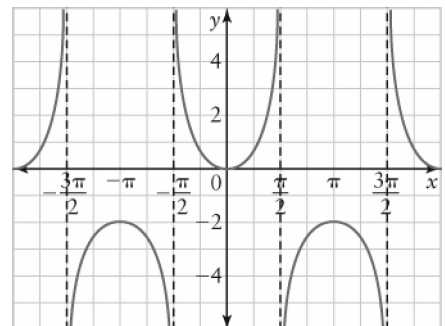
17. The graph of $y = 1$ intersects the graph of $y = \tan x$ at
- a. $\frac{\pi}{2}$ b. $\frac{\pi}{4}$ c. $\frac{\pi}{3}$ d. π

18. Determine an equation for the sinusoidal function shown.



- a. $y = -2 \cos x + 1$ b. $y = 2 \cos \pi x$
c. $y = -\cos \pi x + 1$ d. $y = -2 \cos x$

19. Determine an equation for the function shown.



- a. $y = \tan x$ b. $y = \sec x - 1$
c. $y = \sec x$ d. $y = \csc x - 1$

20. Which of these is a possible solution for $\cos^2 x - \frac{1}{2} = 0$ in the interval $x \in [0, 2\pi]$?
- a. $x = \frac{\pi}{4}$ b. $x = \frac{7\pi}{4}$ c. $x = \frac{5\pi}{4}$
d. all of the above
21. Determine the instantaneous rate of change of the graph of $y = \sin x$ when $x = \pi$.
- a. 0 b. -1 c. 1 d. π
22. Which of the following is most likely to be the instantaneous rate of change of the graph of $y = \sin x$ when $x = 4$?
- a. 0 b. -0.65 c. 1 d. 0.65
23. The function $y = 5^x$ passes through the point
- a. (5, 1) b. (-1, 5) c. (1, 5)
d. (5, -1)
24. Another way of writing $5 = \log_4 1024$ is
- a. $5^4 = 1024$ b. $1024 = 4^5$
c. $1024^{-4} = 5$ d. $5^{1024} = 4$
25. The function $y = -2 \log(3x + 1)$ is
- a. reflected in the x -axis
b. reflected in the y -axis
c. translated down 1 unit
d. translated left 3 units
26. Evaluate $\log_5 \sqrt{625}$.
- a. 2 b. 5 c. 25 d. 4
27. Evaluate $\log_4 \left(\sqrt{256} \right)^4$.
- a. 4 b. 16 c. 1 d. 8
28. The pH of a solution with a hydronium ion concentration of 7.54×10^{-4} mol/L is
- a. 9.21 b. 7.54 c. 3.12
d. 6.41
29. Solve the equation $3 \log_3 27 + 9 \log_3 x = 3 \log_3 729$.
- a. $x = 3$ b. $x = 9$ c. $x = 6$
d. $x = 1$
30. Solve the equation $\log_2(2x - 1) - \log_2(x + 4) = 2$.
- a. $x = -\frac{17}{2}$ b. $x = -\frac{5}{2}$
c. $x = -\frac{15}{2}$ d. none of the above

Short Answer

31. Determine the type of polynomial function (linear, quadratic, cubic, etc.) that the table of values represents.

x	y
-3	7
-2	9
-1	5
0	1
1	3
2	17
3	49

32. Determine the average rate of change of the function $y = 2x^4 - x^2$ from $x = -2$ to $x = 2$.
33. Solve by factoring.
- a) $3x^4 - 48 = 0$
- b) $-x^3 + 12x^2 - 47x + 60 = 0$
- c) $21x^4 - 7x^3 - 6x^2 + 2x = 0$

37. Simplify $\sin\left(\frac{\pi}{2} - x\right) + \sin(\pi - x) + \sin\left(\frac{3\pi}{2} - x\right) + \sin(2\pi - x)$.

38. Describe the difference between $y = \frac{1}{\cos x}$ and $y = \cos^{-1}x$.

34. Determine the interval(s) where the function

$$f(x) = -\frac{1}{2x + 10} \text{ is}$$

- a) positive
- b) increasing
35. Determine the slope of the tangent to the curve $f(x) = \frac{5}{x^2 + 36}$ at $x = 0$.

36. Solve.

a) $\frac{6}{x+3} > 2$

b) $\frac{2x+4}{x-2} \geq 0$

c) $\frac{x^2 - 4x - 12}{x^2 - 25} \geq 0$

d) $\frac{x}{x+4} < \frac{x+4}{x}$

39. The half-life of strontium-90 is 29 years. Find the mass remaining after 18 years if a 100-g sample is left to decay.

40. Evaluate, using the laws of logarithms.
 $\log_{18} 9 + \log_{18} 864 - \log_{18} 4 + \log_{18} 3$

Problem

41. Sketch a graph of
 $y = \frac{1}{2} \sin \left[2\pi \frac{(x-1)}{2} \right] + 3$ for two
cycles.
42. List the steps and explain the
effect of each transformation to
graph the function
 $y = -3 \log[-2(x-1)] + 4$.
43. If \$25 000 is invested in a
hedge fund that pays 12.75%
interest compounded annually,
how long will it take for that
investment to be worth \$75
000?
44. Sketch a graph of the function
 $f(x) = 2^{2x} - 1$ and its inverse
 $f^{-1}(x)$. Compare the graph of
 $f^{-1}(x)$ to the graph of the
function $g(x) = \frac{1}{2} \log_2(x+1)$.
What conclusions can you
make?

Answer Section

MULTIPLE CHOICE

1. ANS: A PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 1.1 LOC: C1.1
TOP: Polynomial and Rational Functions
KEY: degree
2. ANS: D PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Sections 1.2, 1.3 LOC: C1.2, C1.9
TOP: Polynomial and Rational Functions
KEY: symmetry
3. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 1.2 LOC: C1.2, C1.3
TOP: Polynomial and Rational Functions
KEY: degree, graph
4. ANS: D PTS: 1 DIF: 3
REF: Knowledge and Understanding; Application
OBJ: Section 1.4 LOC: C1.6
TOP: Polynomial and Rational Functions
KEY: transformations
5. ANS: A PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 1.2 LOC: C1.2, C1.3
TOP: Polynomial and Rational Functions
KEY: end behaviour, graph

6. ANS: D PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 1.2 LOC: C1.1, C1.2
TOP: Polynomial and Rational Functions
KEY: finite differences
7. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 1.3 LOC: C1.3
TOP: Polynomial and Rational Functions
KEY: intervals, positive
8. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 1.2 LOC: C1.2, C1.3
TOP: Polynomial and Rational Functions
KEY: degree, graph
9. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 2.2 LOC: C3.2
TOP: Polynomial and Rational Functions
KEY: factor theorem, integral zero theorem
10. ANS: C PTS: 1 DIF: 2
REF: Knowledge and Understanding; Application
OBJ: Section 2.2 LOC: C3.2
TOP: Polynomial and Rational Functions
KEY: factor theorem, rational zero theorem
11. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 4.1 LOC: B1.1
TOP: Trigonometric Functions KEY: radian

12. ANS: B PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 4.2 LOC: B1.4
TOP: Trigonometric Functions
KEY: reciprocal trigonometric ratio, special angles
13. ANS: C PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 4.2 LOC: B1.4
TOP: Trigonometric Functions
KEY: reciprocal trigonometric ratio, special angles
14. ANS: D PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 4.2 LOC: B1.4
TOP: Trigonometric Functions
KEY: reciprocal trigonometric ratio, special angles
15. ANS: C PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 4.2 LOC: B1.4
TOP: Trigonometric Functions
KEY: reciprocal trigonometric ratio, special angles
16. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 4.2 LOC: B1.3
TOP: Trigonometric Functions
KEY: primary trigonometric ratio, technology
17. ANS: B PTS: 1 DIF: 1
REF: Knowledge and Understanding; Application
OBJ: Section 5.1 LOC: B2.2
TOP: Trigonometric Functions
KEY: primary trigonometric function

18. ANS: C PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 5.3 LOC: B2.6
TOP: Trigonometric Functions
KEY: graph, equation, sinusoidal function
19. ANS: B PTS: 1 DIF: 3
REF: Knowledge and Understanding
OBJ: Section 5.2 LOC: B2.6
TOP: Trigonometric Functions
KEY: graph, equation, reciprocal trigonometric function
NOT: Extend and Challenge topic
20. ANS: D PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 5.4 LOC: B3.4
TOP: Trigonometric Functions
KEY: quadratic trigonometric equation
21. ANS: B PTS: 1 DIF: 2
REF: Knowledge and Understanding; Application
OBJ: Section 5.5 LOC: D1.8, D1.9
TOP: Characteristics of Functions
KEY: instantaneous rate of change, primary trigonometric function
22. ANS: B PTS: 1 DIF: 2
REF: Knowledge and Understanding; Application
OBJ: Section 5.5 LOC: D1.8, D1.9
TOP: Characteristics of Functions KEY: instantaneous rate of change
23. ANS: C PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 6.1 LOC: D3.1
TOP: Characteristics of Functions KEY: exponential function

24. ANS: B PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 6.2 LOC: A1.3
TOP: Exponential and Logarithmic Functions
KEY: logarithm
25. ANS: A PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 6.3 LOC: A2.3
TOP: Exponential and Logarithmic Functions
KEY: transformations, logarithmic function
26. ANS: A PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 6.4 LOC: A1.4
TOP: Exponential and Logarithmic Functions
KEY: power law of logarithms
27. ANS: D PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 6.4 LOC: A1.4
TOP: Exponential and Logarithmic Functions
KEY: power law of logarithms
28. ANS: C PTS: 1 DIF: 3
REF: Knowledge and Understanding; Application
OBJ: Section 6.5 LOC: A2.4, A3.4
TOP: Exponential and Logarithmic Functions
KEY: logarithmic scales NOT: pH scale
29. ANS: A PTS: 1 DIF: 2
REF: Knowledge and Understanding
OBJ: Section 7.4 LOC: A3.3, A1.4
TOP: Exponential and Logarithmic Functions
KEY: logarithmic equation

30. ANS: D PTS: 1 DIF: 3
REF: Knowledge and Understanding
OBJ: Section 7.4 LOC: A1.4, A3.3
TOP: Exponential and Logarithmic Functions
KEY: logarithmic equation, extraneous root

SHORT ANSWER

31. ANS:
cubic

PTS: 1 DIF: 2
REF: Knowledge and Understanding; Application
OBJ: Section 1.2 LOC: C1.2
TOP: Polynomial and Rational Functions
KEY: finite differences

32. ANS:
0

PTS: 1 DIF: 1
REF: Knowledge and Understanding
OBJ: Section 1.5 LOC: D1.4, D1.7
TOP: Characteristics of Functions KEY: average rate of change

33. ANS:

a) $-2, 2$

b) $3, 4, 5$

c) $-\sqrt{\frac{2}{7}}, 0, \frac{1}{3}, \sqrt{\frac{2}{7}}$

PTS: 1 DIF: 3

REF: Knowledge and Understanding

OBJ: Section 2.3 LOC: C3.4

TOP: Polynomial and Rational Functions

KEY: polynomial equation

NOT: A variety of factoring techniques is required.

34. ANS:

a) $x < -5$

b) $x \in \mathbb{R}, x \neq -5$

PTS: 1 DIF: 2

REF: Knowledge and Understanding

OBJ: Section 3.1 LOC: C2.1

TOP: Polynomial and Rational Functions

KEY: reciprocal of linear function, positive, increasing

35. ANS:

$m = 0$

PTS: 1 DIF: 2

REF: Knowledge and Understanding; Application

OBJ: Section 3.2 LOC: C2.1, D1.7, D1.8

TOP: Polynomial and Rational Functions, Characteristics of Functions

KEY: instantaneous rate of change

36. ANS:

a) $-3 < x < 0$

b) $x \leq -2$ or $x > 2$

c) $x < -5$ or $-2 \leq x < 5$ or $x \geq 6$

d) $-4 < x < -2$ or $x > 0$

PTS: 1

DIF: 3

REF: Knowledge and Understanding

OBJ: Section 3.4

LOC: C4.1, C4.2

TOP: Polynomial and Rational Functions

KEY: rational inequality

37. ANS:

0

PTS: 1

DIF: 3

REF: Knowledge and Understanding; Application

OBJ: Section 4.3

LOC: B3.1

TOP: Trigonometric Functions

KEY: equivalent trigonometric expression

38. ANS:

$y = \frac{1}{\cos x}$ is the equation for the reciprocal of the sine function. It is the identity for the reciprocal trigonometric function known as $y = \sec x$. $y = \cos^{-1}x$ represents the inverse of the function $y = \cos x$. Although not a function itself (since it fails the vertical line test), it is used to determine the value of an angle x (in $y = \cos x$) when the value of the ratio y is known.

PTS: 1

DIF: 3

REF: Knowledge and Understanding; Communication

OBJ: Section 5.2

LOC: B2.3

TOP: Trigonometric Functions

KEY: inverse, reciprocal

39. ANS:
65.0 g

PTS: 1 DIF: 2

REF: Knowledge and Understanding; Application

OBJ: Section 7.2 LOC: A3.2, A3.4

TOP: Exponential and Logarithmic Functions

KEY: exponential equation, half-life

40. ANS:
3

PTS: 1 DIF: 2

REF: Knowledge and Understanding

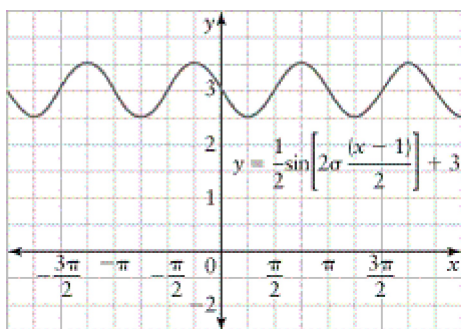
OBJ: Section 7.3 LOC: A1.4, A3.1

TOP: Exponential and Logarithmic Functions

KEY: laws of logarithms

PROBLEM

41. ANS:



PTS: 1 DIF: 3

REF: Knowledge and Understanding

OBJ: Section 5.3 LOC: B2.5

TOP: Trigonometric Functions

KEY: sinusoidal function, graph, equation

42. ANS:

vertically stretched by a factor of 3, horizontally compressed by a factor of $\frac{1}{2}$, reflected in both the x - and y -axes, and translated right 1 unit and up 4 units

PTS: 1

DIF: 3

REF: Knowledge and Understanding; Communication

OBJ: Section 6.3

LOC: A2.3

TOP: Exponential and Logarithmic Functions

KEY: transformations, logarithmic function

43. ANS:

Substitute values into formula $A = P(1 + i)^n$ and solve for n .
approximately 9.15 years

PTS: 1

DIF: 3

REF: Knowledge and Understanding; Application

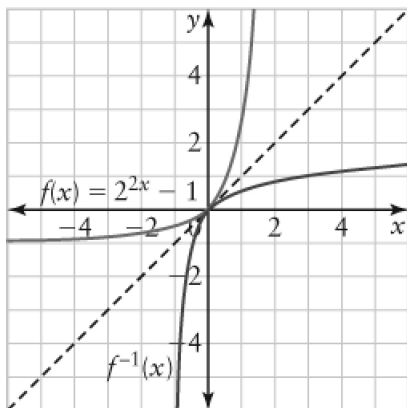
OBJ: Section 6.4

LOC: A1.4, A2.4

TOP: Exponential and Logarithmic Functions

KEY: power law of logarithms

44. ANS:



$$f^{-1}(x) = g(x)$$

PTS: 1

DIF: 3

REF: Knowledge and Understanding; Thinking; Communication

OBJ: Sections 6.1, 6.3

LOC: A2.2, A2.3

TOP: Exponential and Logarithmic Functions

KEY: exponential function, inverse, transformations, logarithmic function