Question ID 005e9982

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 005e9982

$$f(x) = 9{,}000(0.66)^x$$

The given function f models the number of advertisements a company sent to its clients each year, where x represents the number of years since 1997, and $0 \leq x \leq 5$. If $y = f(x)$ is graphed in the *xy*-plane, which of the following is the best interpretation of the *y*-intercept of the graph in this context?

A. The minimum estimated number of advertisements the company sent to its clients during the 5 years was $1{,}708$.

B. The minimum estimated number of advertisements the company sent to its clients during the 5 years was $9{,}000$.

C. The estimated number of advertisements the company sent to its clients in 1997 was $1{,}708$.

D. The estimated number of advertisements the company sent to its clients in 1997 was $9{,}000$.

Question ID fe81a236

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: fe81a236

The function g is defined by $g(x) = x(x-2)(x+6)^2$. The value of $g(7-w)$ is 0, where w is a constant. What is the sum of all possible values of w?

Question ID 54bf74ea

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 54bf74ea

$$p(t) = 90{,}000(1.06)^t$$

The given function p models the population of Lowell t years after a census. Which of the following functions best models the population of Lowell m months after the census?

A. $r(m) = \frac{90{,}000}{12}(1.06)^m$

B. $r(m) = 90{,}000\left(\frac{1.06}{12}\right)^m$

C. $r(m) = 90{,}000\left(\frac{1.06}{12}\right)^{\frac{m}{12}}$

D. $r(m) = 90{,}000(1.06)^{\frac{m}{12}}$

Question ID a51ff0d6

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: a51ff0d6

$$f(x) = (x + 7)^2 + 4$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

Question ID 427f0eea

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 427f0eea

The function f gives the product of a number, x, and a number that is 91 more than x. Which equation defines f?

A. $f(x) = x^2 + x + 91$

B. $f(x) = x^2 + 91$

C. $f(x) = x^2 + 91x$

D. $f(x) = x^2 + 91x + 91$

Question ID 32dc74a4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 32dc74a4

A right rectangular prism has a height of 9 inches. The length of the prism's base is x inches, which is 7 inches more than the width of the prism's base. Which function V gives the volume of the prism, in cubic inches, in terms of the length of the prism's base?

A. $V(x) = x(x + 9)(x + 7)$

B. $V(x) = x(x + 9)(x - 7)$

C. $V(x) = 9x(x + 7)$

D. $V(x) = 9x(x - 7)$

Question ID 1d670e5f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 1d670e5f

$$f(x) = x^2 - 48x + 2{,}304$$

What is the minimum value of the given function?

Question ID 78eae128

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 78eae128

$$y = 2(x - d)(x + d)(x + g)(x - d)$$

In the given equation, d and g are unique positive constants. When the equation is graphed in the *xy*-plane, how many distinct *x*-intercepts does the graph have?

A. 4

B. 3

C. 2

D. 1

Question ID 9502a1aa

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 9502a1aa

An auditorium has seats for $1{,}800$ people. Tickets to attend a show at the auditorium currently cost $\$4.00$. For each $\$1.00$ increase to the ticket price, 100 fewer tickets will be sold. This situation can be modeled by the equation $y = -100x^2 + 1{,}400x + 7{,}200$, where x represents the increase in ticket price, in dollars, and y represents the revenue, in dollars, from ticket sales. If this equation is graphed in the *xy*-plane, at what value of x is the maximum of the graph?

A. 4

B. 7

C. 14

D. 18

Question ID 80803aed

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

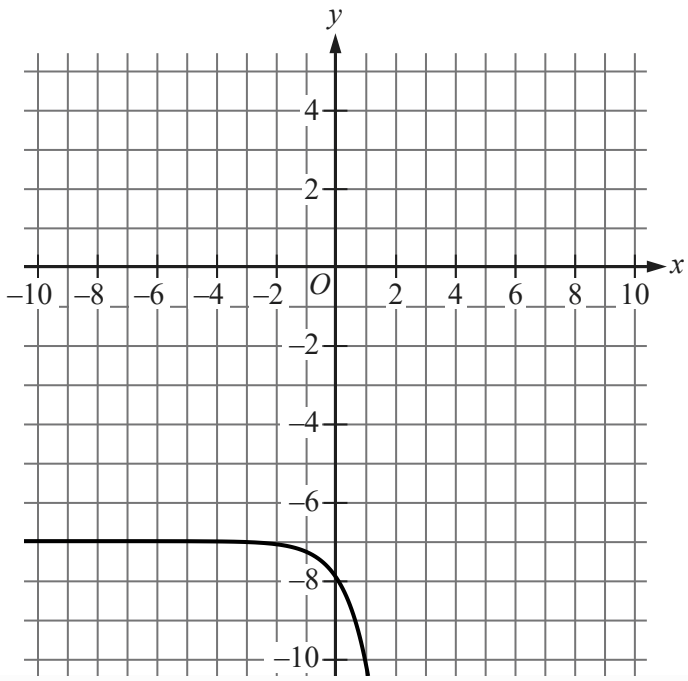
ID: 80803aed

The function g is defined by $g(x) = (x + 14)(t - x)$, where t is a constant. In the *xy*-plane, the graph of $y = g(x)$ passes through the point $(24, 0)$. What is the value of $g(0)$?

Question ID 455fd7e9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 455fd7e9



The graph of $y = f(x)$ is shown, where $f(x) = ab^x + c$, and a, b, and c are constants. For how many values of x does $f(x) = 0$?

A. Three

B. Two

C. One

D. Zero

Question ID e24f00be

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: e24f00be

The product of two positive integers is 462. If the first integer is 5 greater than twice the second integer, what is the smaller of the two integers?

Question ID a2d5ec41

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: a2d5ec41

Two variables, x and y, are related such that for each increase of 1 in the value of x, the value of y increases by a factor of 4. When $x = 0$, $y = 200$. Which equation represents this relationship?

A. $y = 4$msup

B. $y = 4$msup

C. $y = 200$msup

D. $y = 200$msup

Question ID 5ec80061

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 5ec80061

$$f(t) = 8{,}000(0.65)^t$$

The given function f models the number of coupons a company sent to their customers at the end of each year, where t represents the number of years since the end of 1998, and $0 \leq t \leq 5$. If $y = f(t)$ is graphed in the *ty*-plane, which of the following is the best interpretation of the *y*-intercept of the graph in this context?

A. The minimum estimated number of coupons the company sent to their customers during the 5 years was $1{,}428$.

B. The minimum estimated number of coupons the company sent to their customers during the 5 years was $8{,}000$.

C. The estimated number of coupons the company sent to their customers at the end of 1998 was $1{,}428$.

D. The estimated number of coupons the company sent to their customers at the end of 1998 was $8{,}000$.

Question ID a6c47b9c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: a6c47b9c

The function f is defined by $f(x) = (-8)(2)^x + 22$. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 14)$

B. $(0, 2)$

C. $(0, 22)$

D. $(0, -8)$

Question ID 1145bfcc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 1145bfcc

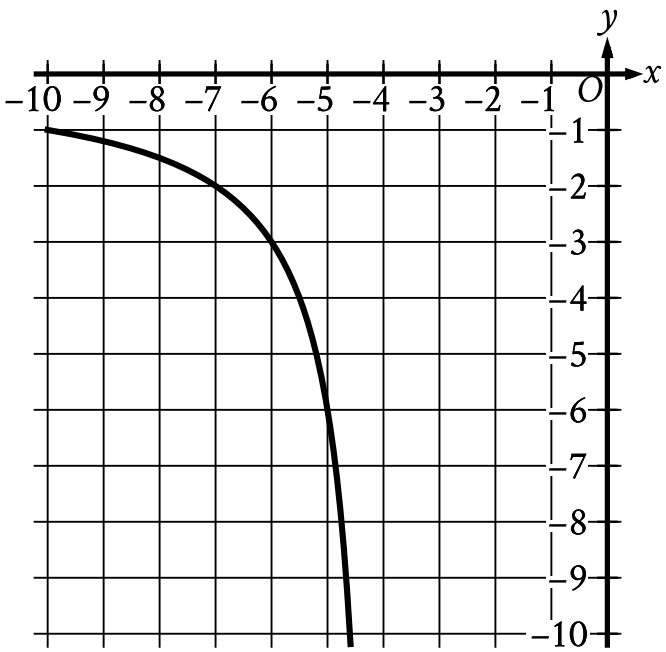
$$y = x^2 - 14x + 22$$

The given equation relates the variables x and y. For what value of x does the value of y reach its minimum?

Question ID c7f7ccdd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: c7f7ccdd



The rational function f is defined by an equation in the form $f(x) = \frac{a}{x+b}$, where a and b are constants. The partial graph of $y = f(x)$ is shown. If $g(x) = f(x + 4)$, which equation could define function g?

A. $g(x) = \frac{6}{x}$

B. $g(x) = \frac{6}{x+4}$

C. $g(x) = \frac{6}{x+8}$

D. $g(x) = \frac{6(x+4)}{x+4}$

Question ID 2833ad7d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 2833ad7d

A model estimates that at the end of each year from 2015 to 2020, the number of squirrels in a population was 150% more than the number of squirrels in the population at the end of the previous year. The model estimates that at the end of 2016, there were 180 squirrels in the population. Which of the following equations represents this model, where n is the estimated number of squirrels in the population t years after the end of 2015 and $t \leq 5$?

A. $n = 72$msup

B. $n = 72$msup

C. $n = 180$msup

D. $n = 180$msup

Question ID 317d165b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 317d165b

$$f(x) = 9(4)^x$$

The function f is defined by the given equation. If $g(x) = f(x + 2)$, which of the following equations defines the function g?

A. $g(x) = 18(4)^x$

B. $g(x) = 144(4)^x$

C. $g(x) = 18(8)^x$

D. $g(x) = 81(16)^x$

Question ID 2a093c45

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 2a093c45

$$f(x) = (x - 10)(x + 13)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. -130

B. -13

C. $-\frac{23}{2}$

D. $-\frac{3}{2}$

Question ID a4a86ebb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: a4a86ebb

In the *xy*-plane, a parabola has vertex $(9, -14)$ and intersects the *x*-axis at two points. If the equation of the parabola is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants, which of the following could be the value of $a + b + c$?

A. -23

B. -19

C. -14

D. -12

Question ID b91b2899

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: b91b2899

$$f(x) = (1.84)^{\frac{x}{4}}$$

The function f is defined by the given equation. The equation can be rewritten as $f(x) = \left(1 + \frac{p}{100}\right)^x$, where p is a constant. Which of the following is closest to the value of p?

A. 16

B. 21

C. 46

D. 96

Question ID f5f840a0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: f5f840a0

For the function f, $f(0) = 86$, and for each increase in x by 1, the value of $f(x)$ decreases by 80%. What is the value of $f(2)$?

Question ID 03d0309b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 03d0309b

$$f(x) = (x - 1)(x + 3)(x - 2)$$

In the *xy*-plane, when the graph of the function f, where $y = f(x)$, is shifted up 6 units, the resulting graph is defined by the function g. If the graph of $y = g(x)$ crosses through the point $(4, b)$, where b is a constant, what is the value of b?

Question ID 1caa83ee

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 1caa83ee

For the function q, the value of $q(x)$ decreases by 45% for every increase in the value of x by 1. If $q(0) = 14$, which equation defines q?

A. $q(x) = 0.55(14)^x$

B. $q(x) = 1.45(14)^x$

C. $q(x) = 14(0.55)^x$

D. $q(x) = 14(1.45)^x$

Question ID 3ae42a32

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 3ae42a32

The functions g and h are defined by the given equations, where $x \geq 0$. Which of the following equations displays, as a constant or coefficient, the minimum value of the function it defines, where $x \geq 0$?

I. $g(x) = 18(1.16)(1.4)^{x+2}$

II. $h(x) = 18(1.4)^{x+4}$

A. I only

B. II only

C. I and II

D. Neither I nor II

Question ID ae4d719d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: ae4d719d

The function f is defined by $f(x) = a^x + b$, where a and b are constants and $a > 0$. In the *xy*-plane, the graph of $y = f(x)$ has a *y*-intercept at $(0, -25)$ and passes through the point $(2, 23)$. What is the value of $a + b$?

Question ID 6a8a7fbd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 6a8a7fbd

The function f is defined by $f(x) = a\sqrt{x+b}$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x)$ passes through the point $(-24, 0)$, and $f(24) < 0$. Which of the following must be true?

A. $f(0) = 24$

B. $f(0) = -24$

C. $a > b$

D. $a < b$

Question ID 81aa6aa9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 81aa6aa9

When the quadratic function f is graphed in the *xy*-plane, where $y = f(x)$, its vertex is $(-3, 6)$. One of the *x*-intercepts of this graph is $\left(-\frac{17}{4}, 0\right)$. What is the other *x*-intercept of the graph?

A. $\left(-\frac{29}{4}, 0\right)$

B. $\left(-\frac{7}{4}, 0\right)$

C. $\left(\frac{5}{4}, 0\right)$

D. $\left(\frac{17}{4}, 0\right)$

Question ID b017359f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: b017359f

A submersible device is used for ocean research. The function $g(x) = -\frac{1}{55}(x + 19)(x - 35)$ gives the depth below the surface of the ocean, in meters, of the submersible device x minutes after collecting a sample, where $x > 0$. How many minutes after collecting the sample did it take for the submersible device to reach the surface of the ocean?

Question ID 73935d4f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 73935d4f

A park ranger hung squirrel houses each in the shape of a right rectangular prism for fox squirrels. Each house has a height of 11 inches. The length of each house's base is x inches, which is 1 inch more than the width of the house's base. Which function V gives the volume of each house, in cubic inches, in terms of the length of the house's base?

A. $V(x) = 11x(x - 1)$

B. $V(x) = 11x(x + 1)$

C. $V(x) = x(x + 11)(x - 1)$

D. $V(x) = x(x + 11)(x + 1)$

Question ID 3e4e3220

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 3e4e3220

x	y
21	-8
23	8
25	-8

The table shows three values of x and their corresponding values of y, where $y = f(x) + 4$ and f is a quadratic function. What is the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

Question ID eb92492d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: eb92492d

The area of a triangle is equal to x^2 square centimeters. The length of the base of the triangle is $2x + 22$ centimeters, and the height of the triangle is $x - 10$ centimeters. What is the value of x?

Question ID 16ff7151

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 16ff7151

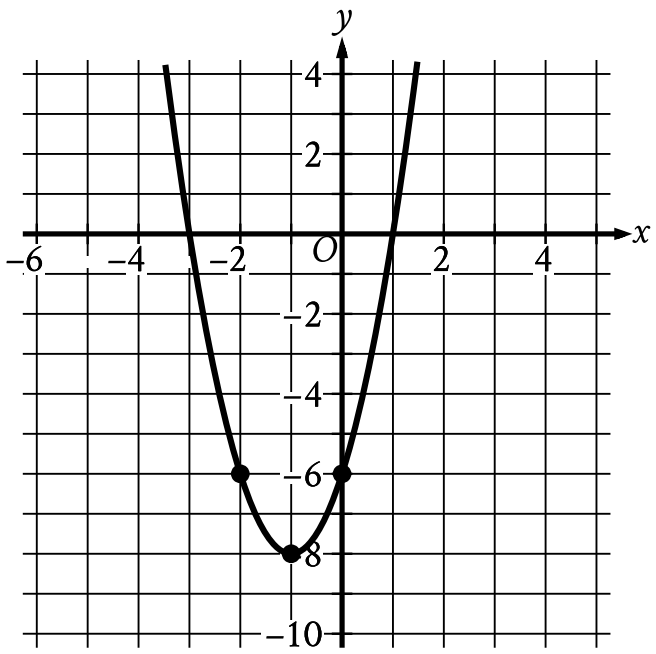
$$f(x) = (x - 2)(x + 15)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

Question ID a44eb7d8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: a44eb7d8



The graph of $y = 2x^2 + bx + c$ is shown, where b and c are constants. What is the value of bc?

Question ID 79eb41b9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 79eb41b9

The quadratic function g models the depth, in meters, below the surface of the water of a seal t minutes after the seal entered the water during a dive. The function estimates that the seal reached its maximum depth of 302.4 meters 6 minutes after it entered the water and then reached the surface of the water 12 minutes after it entered the water. Based on the function, what was the estimated depth, to the nearest meter, of the seal 10 minutes after it entered the water?

Question ID f85886ff

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: f85886ff

A machine launches a softball from ground level. The softball reaches a maximum height of 51.84 meters above the ground at 1.8 seconds and hits the ground at 3.6 seconds. Which equation represents the height above ground h, in meters, of the softball t seconds after it is launched?

A. $h = -t^2 + 3.6$

B. $h = -t^2 + 51.84$

C. $h = -16\text{msup} - 3.6$

D. $h = -16\text{msup} + 51.84$

Question ID d5b08036

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: d5b08036

$$y = 576^{(2x+2)}$$

The graph of the given equation in the *xy*-plane has a *y*-intercept of (r, s). Which of the following equivalent equations displays the value of s as a constant, a coefficient, or the base?

A. $y =$ msup

B. $y =$ msup

C. $y = \frac{1}{24}$ msup

D. $y = \frac{1}{576}$ msup

Question ID 95954b57

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 95954b57

The function f is defined by $f(x) = a^x + b$, where a and b are constants. In the xy-plane, the graph of $y = f(x)$ has an x-intercept at $(2, 0)$ and a y-intercept at $(0, -323)$. What is the value of b?

Question ID eec1aa3e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: eec1aa3e

The function g is defined by $g(x) = \frac{|x|}{a} - 14$, where $a < 0$. What is the product of $g(15a)$ and $g(7a)$?

Question ID 1b30fd79

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 1b30fd79

x	$g(x)$
-27	3
-9	0
21	5

The table shows three values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$ and f is a linear function. What is the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane?

A. $(0, 36)$

B. $(0, 12)$

C. $(0, 4)$

D. $(0, -9)$

Question ID 41ab1df4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 41ab1df4

$$f(x) = 272(2)^x$$

The function f is defined by the given equation. If $h(x) = f(x - 4)$, which of the following equations defines function h?

A. $h(x) = 17(2)^x$

B. $h(x) = 68(2)^x$

C. $h(x) = 272(16)^x$

D. $h(x) = 272(8)^x$

Question ID 7b54c7af

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 7b54c7af

The functions f and g are defined by the given equations, where $x \geq 0$. Which of the following equations displays, as a constant or coefficient, the maximum value of the function it defines, where $x \geq 0$?

I. $f(x) = 33(0.4)^{x+3}$

II. $g(x) = 33(0.16)(0.4)^{x-2}$

A. I only

B. II only

C. I and II

D. Neither I nor II

Question ID f9e32510

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: f9e32510

The function $f(x) = \frac{1}{9}(x - 7)^2 + 3$ gives a metal ball's height above the ground $f(x)$, in inches, x seconds after it started moving on a track, where $0 \leq x \leq 10$. Which of the following is the best interpretation of the vertex of the graph of $y = f(x)$ in the *xy*-plane?

A. The metal ball's minimum height was 3 inches above the ground.

B. The metal ball's minimum height was 7 inches above the ground.

C. The metal ball's height was 3 inches above the ground when it started moving.

D. The metal ball's height was 7 inches above the ground when it started moving.

Question ID 23923e5b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 23923e5b

A quadratic function models the height, in feet, of an object above the ground in terms of the time, in seconds, after the object is launched off an elevated surface. The model indicates the object has an initial height of 10 feet above the ground and reaches its maximum height of $1{,}034$ feet above the ground 8 seconds after being launched. Based on the model, what is the height, in feet, of the object above the ground 10 seconds after being launched?

A. 234

B. 778

C. 970

D. $1{,}014$

Question ID 6ef1d0a7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 6ef1d0a7

$$f(x) = (x - 44)(x - 46)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. 46

B. 45

C. 44

D. -1

Question ID 1ba110f2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 1ba110f2

$$P(t) = 260(1.04)^{(\frac{6}{4})t}$$

The function P models the population, in thousands, of a certain city t years after 2003. According to the model, the population is predicted to increase by 4% every n months. What is the value of n?

A. 8

B. 12

C. 18

D. 72

Question ID b9b42f28

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: b9b42f28

Function f is a quadratic function where $f(-20) = 0$ and $f(-4) = 0$. The graph of $y = f(x)$ in the *xy*-plane has a vertex at $(r, -64)$. What is the value of r?

Question ID aefae524

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: aefae524

$$P(t) = 290(1.04)^{(\frac{4}{6})t}$$

The function P models the population, in thousands, of a certain city t years after 2005. According to the model, the population is predicted to increase by $n\%$ every 18 months. What is the value of n?

A. 0.38

B. 1.04

C. 4

D. 6

Question ID 49de5e98

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 49de5e98

$$f(x) = 4x^2 - 50x + 126$$

The given equation defines the function f. For what value of x does $f(x)$ reach its minimum?

Question ID 3de3402c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 3de3402c

The functions f and g are defined by the given equations, where $x \geq 0$. Which of the following equations displays, as a constant or coefficient, the maximum value of the function it defines, where $x \geq 0$?

I. $f(x) = 18(1.25)^x + 41$

II. $g(x) = 9(0.73)^x$

A. I only

B. II only

C. I and II

D. Neither I nor II

Question ID 5e98384e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 5e98384e

The function f is defined by $f(x) = (x - 6)(x - 2)(x + 6)$. In the *xy*-plane, the graph of $y = g(x)$ is the result of translating the graph of $y = f(x)$ up 4 units. What is the value of $g(0)$?

Question ID c56a9f57

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: c56a9f57

The first term of a sequence is 9. Each term after the first is 4 times the preceding term. If w represents the nth term of the sequence, which equation gives w in terms of n?

A. $w = 4(9^n)$

B. $w = 4(9^{n-1})$

C. $w = 9(4^n)$

D. $w = 9(4^{n-1})$

Question ID 24331e5e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 24331e5e

$$f(t) = 55t - 2t^2$$

The function f is defined by the given equation. The function g is defined by $g(t) = f(t) + 3$. Which expression represents the maximum value of $g(t)$?

A. $3 +$ msup

B. $3 + 2$msup

C. $3 - 2$msup

D. $3 -$ msup

Question ID 2f88a547

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 2f88a547

At the time that an article was first featured on the home page of a news website, there were 40 comments on the article. An exponential model estimates that at the end of each hour after the article was first featured on the home page, the number of comments on the article had increased by 190% of the number of comments on the article at the end of the previous hour. Which of the following equations best represents this model, where C is the estimated number of comments on the article t hours after the article was first featured on the home page and $t \leq 4$?

A. $C = 40$msup

B. $C = 40$msup

C. $C = 40$msup

D. $C = 40$msup

Question ID d93eac68

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: d93eac68

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 15$ has a *y*-intercept at $\left(0, -\frac{99}{7}\right)$. The product of a and b is $\frac{65}{7}$. What is the value of a?

Question ID ebf50998

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: ebf50998

Function f is defined by $f(x) = (x + 6)(x + 5)(x + 1)$. Function g is defined by $g(x) = f(x - 1)$. The graph of $y = g(x)$ in the *xy*-plane has *x*-intercepts at $(a, 0)$, $(b, 0)$, and $(c, 0)$, where a, b, and c are distinct constants. What is the value of $a + b + c$?

A. -15

B. -9

C. 11

D. 15

Question ID 7189ece4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 7189ece4

For the exponential function f, the value of $f(1)$ is k, where k is a constant. Which of the following equivalent forms of the function f shows the value of k as the coefficient or the base?

A. $f(x) = 50(2)^{x+1}$

B. $f(x) = 80(2)^{x}$

C. $f(x) = 128(2)^{x-1}$

D. $f(x) = 205(2)^{x-2}$

Question ID ca44c7ce

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: ca44c7ce

$$f(x) = |59 - 2x|$$

The function f is defined by the given equation. For which of the following values of k does $f(k) = 3k$?

A. $\frac{59}{5}$

B. $\frac{59}{2}$

C. $\frac{177}{5}$

D. 59

Question ID 5b955063

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 5b955063

A rectangle has an area of 155 square inches. The length of the rectangle is 4 inches less than 7 times the width of the rectangle. What is the width of the rectangle, in inches?

Question ID 99b8a5c8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 99b8a5c8

$$f(x) = ax^2 + 4x + c$$

In the given quadratic function, a and c are constants. The graph of $y = f(x)$ in the *xy*-plane is a parabola that opens upward and has a vertex at the point (h, k), where h and k are constants. If $k < 0$ and $f(-9) = f(3)$, which of the following must be true?

I. $c < 0$

II. $a \geq 1$

A. I only

B. II only

C. I and II

D. Neither I nor II

Question ID 98f7ab7a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 98f7ab7a

Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the *xy*-plane, the graph of $y = f(x) - 12$ has a *y*-intercept at $\left(0, -\frac{75}{7}\right)$. The product of a and b is $\frac{320}{7}$. What is the value of a?

Question ID 06fac60b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 06fac60b

$$f(x) = 5{,}470(0.64)^{\frac{x}{12}}$$

The function f gives the value, in dollars, of a certain piece of equipment after x months of use. If the value of the equipment decreases each year by $p\%$ of its value the preceding year, what is the value of p?

A. 4

B. 5

C. 36

D. 64

Question ID da9efa2f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: da9efa2f

$$f(x) = (x - 14)(x + 19)$$

The function f is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

A. -266

B. -19

C. $-\frac{33}{2}$

D. $-\frac{5}{2}$

Question ID 033e2be3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 033e2be3

The functions f and g are defined by the given equations.

$$f(x) = 3 + \left| -2x - x^2 \right|$$

$$g(w) = \left| \frac{-w}{w-1} \right| - w + 5$$

If $f(-4) = c$, where c is a constant, what is the value of $g(c)$?

Question ID b7f055bc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: b7f055bc

The function h is defined by $h(x) = a^x + b$, where a and b are positive constants. The graph of $y = h(x)$ in the xy-plane passes through the points $(0, 10)$ and $(-2, \frac{325}{36})$. What is the value of ab?

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. 54

D. 60

Question ID d02e610e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: d02e610e

The function f is defined by $f(x) = a(2.2^x + 2.2^b)$, where a and b are integer constants and $0 < a < b$. The functions g and h are equivalent to function f, where k and m are constants. Which of the following equations displays the *y*-coordinate of the *y*-intercept of the graph of $y = f(x)$ in the *xy*-plane as a constant or coefficient?

I. $g(x) = a(2.2^x + k)$

II. $h(x) = a(2.2)^x + m$

A. I only

B. II only

C. I and II

D. Neither I nor II

Question ID aea3b524

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: aea3b524

Square P has a side length of x inches. Square Q has a perimeter that is 176 inches greater than the perimeter of square P. The function f gives the area of square Q, in square inches. Which of the following defines f?

A. $f(x) = (x + 44)^2$

B. $f(x) = (x + 176)^2$

C. $f(x) = (176x + 44)^2$

D. $f(x) = (176x + 176)^2$

Question ID a9e93fa1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: a9e93fa1

$$f(x) = 4x^2 + 64x + 262$$

The function g is defined by $g(x) = f(x + 5)$. For what value of x does $g(x)$ reach its minimum?

A. -13

B. -8

C. -5

D. -3

Question ID af1aea31

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: af1aea31

Which of the following functions has(have) a minimum value at -3?

I. $f(x) = -6(3)^x - 3$

II. $g(x) = -3(6)^x$

A. I only

B. II only

C. I and II

D. Neither I nor II

Question ID 0bb72c19

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: 0bb72c19

The area of a rectangular banner is $2{,}661$ square inches. The banner's length x, in inches, is 24 inches longer than its width, in inches. Which equation represents this situation?

A. $0 = x^2 - 24x - 2{,}661$

B. $0 = x^2 - 24x + 2{,}661$

C. $0 = x^2 + 24x - 2{,}661$

D. $0 = x^2 + 24x + 2{,}661$

Question ID c3e3b12e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: c3e3b12e

The function f is defined by $f(x) = ax^2 + bx + c$, where a, b, and c are constants. The graph of $y = f(x)$ in the *xy*-plane passes through the points $(7, 0)$ and $(-3, 0)$. If a is an integer greater than 1, which of the following could be the value of $a + b$?

A. -6

B. -3

C. 4

D. 5

Question ID c9e4bac1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	Hard

ID: c9e4bac1

A quadratic function models a projectile's height, in meters, above the ground in terms of the time, in seconds, after it was launched. The model estimates that the projectile was launched from an initial height of 7 meters above the ground and reached a maximum height of 51.1 meters above the ground 3 seconds after the launch. How many seconds after the launch does the model estimate that the projectile will return to a height of 7 meters?

A. 3

B. 6

C. 7

D. 9