

Question ID 8d3089b0

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 8d3089b0

Bacteria are growing in a liquid growth medium. There were **300,000** cells per milliliter during an initial observation. The number of cells per milliliter doubles every **3** hours. How many cells per milliliter will there be **15** hours after the initial observation?

- A. 1,500,000
- B. 2,400,000
- C. 4,500,000
- D. 9,600,000

Question ID 89160f9c

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 89160f9c

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

What is the minimum value of the given function?

Question ID 9e74d905

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 9e74d905

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 $(-\frac{17}{4}, 0)$. What is the other x -intercept of the graph?

- A. $(-\frac{29}{4}, 0)$
- B. $(-\frac{7}{4}, 0)$
- C. $(\frac{5}{4}, 0)$
- D. $(\frac{17}{4}, 0)$

Question ID d1b3d70e

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: d1b3d70e

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 b11955c5

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: b11955c5

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 b2142aba

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: b2142aba

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 6b7c82dd

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 6b7c82dd

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 71875bb0

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 71875bb0

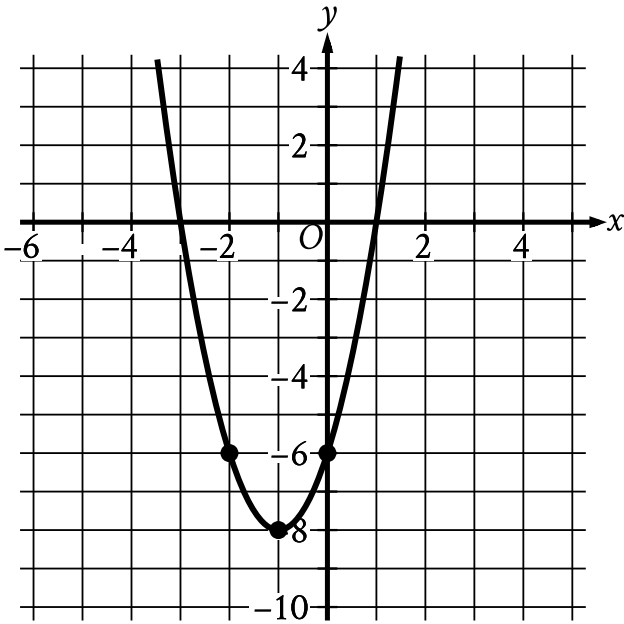
For the function q , the value of $q(x)$ decreases by 45% for every increase in the value of x by 1. If $q(0) = 14$, which equation defines q ?

- 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 d1cf915b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: d1cf915b



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

Question ID af172557

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: af172557

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

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 ec792518

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: ec792518

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

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 d4b3c7eb

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: d4b3c7eb

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

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 de3eaf05

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: de3eaf05

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

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 067262c7

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 067262c7

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 3d0f48a9

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 3d0f48a9

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

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 8e87347e

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 8e87347e

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

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 a25d39ec

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: a25d39ec

The product of two positive integers is ~~4~~**62**. If the first integer is **5** greater than twice the second integer, what is the smaller of the two integers?

Question ID e89e2a0f

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: e89e2a0f

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 2e2b270a

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 2e2b270a

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

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 92fecab6

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 92fecab6

The function $f(x) = 206(1.034)^x$ models the value, in dollars, of a certain bank account by the end of each year from **1957** through **1972**, where x is the number of years after **1957**. Which of the following is the best interpretation of “ $f(5)$ is approximately equal to **243**” in this context?

- A. The value of the bank account is estimated to be approximately **5** dollars greater in **1962** than in **1957**.
- B. The value of the bank account is estimated to be approximately **243** dollars in **1962**.
- C. The value, in dollars, of the bank account is estimated to be approximately **5** times greater in **1962** than in **1957**.
- D. The value of the bank account is estimated to increase by approximately **243** dollars every **5** years between **1957** and **1972**.

Question ID e3b52d28

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: e3b52d28

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. $y = 4(x)^{200}$
- B. $y = 4(200)^x$
- C. $y = 200(x)^4$
- D. $y = 200(4)^x$

Question ID ecbfeafb

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: ecbfeafb

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 2009ef32

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 2009ef32

The product of two positive integers is **546**. If the first integer is **11** greater than twice the second integer, what is the smaller of the two integers?

- A. **7**
- B. **14**
- C. **39**
- D. **78**

Question ID 2c94a7ab

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 2c94a7ab

$$f(x) = (x + 6)(x + 5)(x - 4)$$

The function f is given. Which table of values represents $y = f(x) - 3$?

A.

x	y
−6	−9
−5	−8
4	1

B.

x	y
−6	−3
−5	−3
4	−3

C.

x	y
−6	−3
−5	−2
4	7

D.

x	y
−6	3
−5	3
4	3

Question ID 7c505685

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 7c505685

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 a4f13e81

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: a4f13e81

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

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 065cc8fc

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 065cc8fc

The equation $E(t) = 5(1.8)^t$ gives the estimated number of employees at a restaurant, where t is the number of years since the restaurant opened. Which of the following is the best interpretation of the number 5 in this context?

- A. The estimated number of employees when the restaurant opened
- B. The increase in the estimated number of employees each year
- C. The number of years the restaurant has been open
- D. The percent increase in the estimated number of employees each year

Question ID 914f0fb6

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 914f0fb6

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

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 3c206d51

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 3c206d51

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 1ca5e8ac

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 1ca5e8ac

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 7be44fda

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 7be44fda

x	$f(x)$
-1	10
0	14
1	20

For the quadratic function f , the table shows three values of x and their corresponding values of $f(x)$. Which equation defines f ?

- A. $f(x) = 3x^2 + 3x + 14$
- B. $f(x) = 5x^2 + x + 14$
- C. $f(x) = 9x^2 - x + 14$
- D. $f(x) = x^2 + 5x + 14$

Question ID 2f73623c

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 2f73623c

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

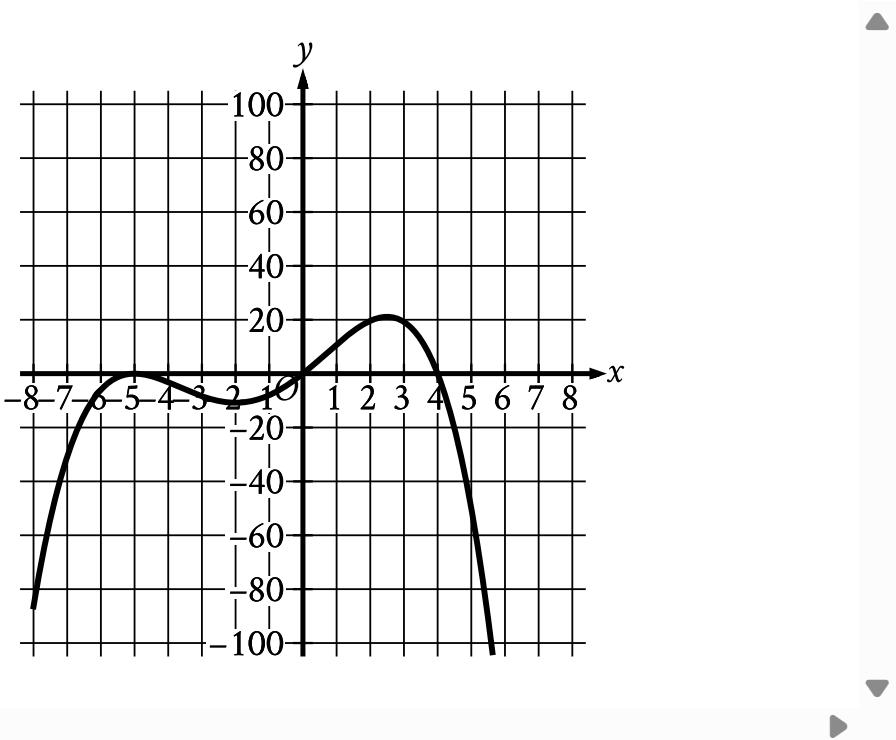
The table shows three values of x and their corresponding values of $g(x)$, where $g(x) = \frac{f(x)}{x+3}$ and f is a linear function. What is the y-intercept of the graph of $y = f(x)$ in the xy -plane?

- A. $(0, 36)$
- B. $(0, 12)$
- C. $(0, 4)$
- D. $(0, -9)$

Question ID ed951a6b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: ed951a6b



Which of the following could be the equation of the graph shown in the xy -plane?

- A. $y = -\frac{1}{10}x(x - 4)(x + 5)$
- B. $y = -\frac{1}{10}x(x - 4)(x + 5)^2$
- C. $y = -\frac{1}{10}x(x - 5)(x + 4)$
- D. $y = -\frac{1}{10}x(x - 5)^2(x + 4)$

Question ID 685e4f6b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 685e4f6b

The function $f(t) = 60,000(2)^{\frac{t}{410}}$ gives the number of bacteria in a population t minutes after an initial observation. How much time, in minutes, does it take for the number of bacteria in the population to double?

Question ID 877585e8

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 877585e8

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. $n = 72(1.5)^t$
- B. $n = 72(2.5)^t$
- C. $n = 180(1.5)^t$
- D. $n = 180(2.5)^t$

Question ID 42bc647d

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 42bc647d

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. $h = -16(t - 1.8)^2 - 3.6$
- D. $h = -16(t - 1.8)^2 + 51.84$

Question ID 6d44de27

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 6d44de27

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

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 31041ee4

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 31041ee4

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 7dea2114

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 7dea2114

Immanuel purchased a certain rare coin on January 1. The function $f(x) = 65(1.03)^x$, where $0 \leq x \leq 10$, gives the predicted value, in dollars, of the rare coin x years after Immanuel purchased it. What is the best interpretation of the statement “ $f(8)$ is approximately equal to **82**” in this context?

- A. When the rare coin's predicted value is approximately **82** dollars, it is **8%** greater than the predicted value, in dollars, on January 1 of the previous year.
- B. When the rare coin’s predicted value is approximately **82** dollars, it is **8** times the predicted value, in dollars, on January 1 of the previous year.
- C. From the day Immanuel purchased the rare coin to **8** years after Immanuel purchased the coin, its predicted value increased by a total of approximately **82** dollars.
- D. **8** years after Immanuel purchased the rare coin, its predicted value is approximately **82** dollars.

Question ID 877bd007

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 877bd007

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

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

Question ID 2584d355

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 2584d355

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 62ba1727

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 62ba1727

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

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

Question ID 62821aef

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 62821aef

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

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 5628913b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 5628913b

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. $C = 40(1.19)^t$
- B. $C = 40(1.9)^t$
- C. $C = 40(19)^t$
- D. $C = 40(2.9)^t$

Question ID 40d75cea

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 40d75cea

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

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 eaee04f9

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: eaee04f9

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 b589168d

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: b589168d

The exponential function g is defined by $g(x) = 19 \cdot a^x$, where a is a positive constant. If $g(3) = 2,375$, what is the value of $g(4)$?

Question ID 70cdc6d2

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 70cdc6d2

A sample of a certain isotope takes **29** years to decay to half its original mass. The function $s(t) = 184(0.5)^{\frac{t}{29}}$ gives the approximate mass of this isotope, in grams, that remains t years after a **184**-gram sample starts to decay. Which statement is the best interpretation of $s(87) = 23$ in this context?

- A. Approximately **23** grams of the sample remains **87** years after the sample starts to decay.
- B. The mass of the sample has decreased by approximately **23** grams **87** years after the sample starts to decay.
- C. The mass of the sample has decreased by approximately **87** grams **23** years after the sample starts to decay.
- D. Approximately **87** grams of the sample remains **23** years after the sample starts to decay.

Question ID 077b2830

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 077b2830

A scientist initially measures **12,000** bacteria in a growth medium. **4** hours later, the scientist measures **24,000** bacteria. Assuming exponential growth, the formula $P = C(2)^{rt}$ gives the number of bacteria in the growth medium, where r and C are constants and P is the number of bacteria t hours after the initial measurement. What is the value of r ?

- A. $\frac{1}{12,000}$
- B. $\frac{1}{4}$
- C. **4**
- D. **12,000**

Question ID 99a754e3

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 99a754e3

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

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 cfee492e

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: cfee492e

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

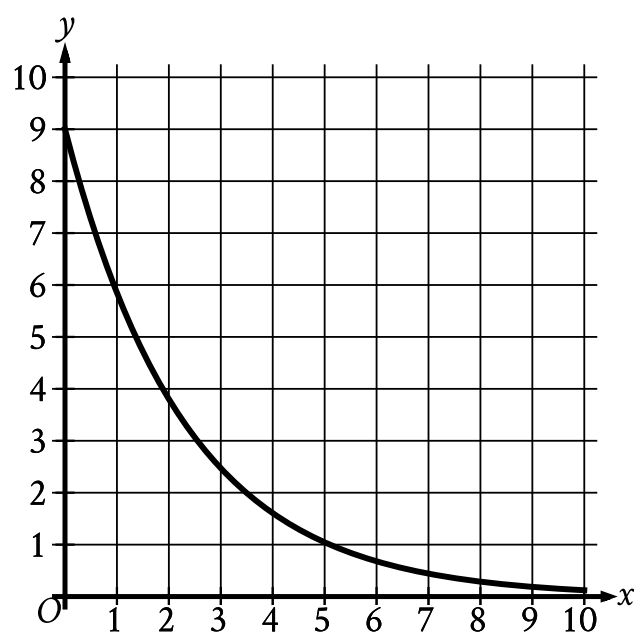
The graph of the given equation in the xy -plane has a y -intercept of (r, s) . Which of the following equivalent equations displays the value of s as a constant, a coefficient, or the base?

- A. $y = 331,776^{(x+1)}$
- B. $y = 24^{(4x+4)}$
- C. $y = \frac{1}{24}(24)^{(4x+5)}$
- D. $y = \frac{1}{576}(576)^{(2x+3)}$

Question ID 92280623

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 92280623



The graph gives the estimated number of catalogs y , in thousands, a company sent to its customers at the end of each year, where x represents the number of years since the end of **1992**, where $0 \leq x \leq 10$. Which statement is the best interpretation of the y -intercept in this context?

- A. The estimated total number of catalogs the company sent to its customers during the first **10** years was **9,000**.
- B. The estimated total number of catalogs the company sent to its customers from the end of **1992** to the end of **2002** was **90**.
- C. The estimated number of catalogs the company sent to its customers at the end of **1992** was **9**.
- D. The estimated number of catalogs the company sent to its customers at the end of **1992** was **9,000**.

Question ID a5dc10ab

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: a5dc10ab

$$p(x) + 57 = x^2$$

The given equation relates the value of x and its corresponding value of $p(x)$ for the function p . What is the minimum value of the function p ?

- A. $-3,249$
- B. -57
- C. 57
- D. $3,249$

Question ID 7d86a6ad

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 7d86a6ad

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

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 1845987d

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 1845987d

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

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

Question ID 77c8bd4a

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 77c8bd4a

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 dfbf8890

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: dfbf8890

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**

Question ID cdc398ca

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: cdc398ca

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

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 583767ba

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 583767ba

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 $(0, -\frac{99}{7})$. The product of a and b is $\frac{65}{7}$. What is the value of a ?

Question ID de3cc97b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: de3cc97b

The first term of a sequence is **9**. Each term after the first is **4** times the preceding term. If *w* represents the *n*th 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 42045837

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 42045837

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 ef091e05

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: ef091e05

$$f(x) = \frac{a-19}{x} + 5$$

In the given function f , a is a constant. The graph of function f in the xy -plane, where $y = f(x)$, is translated **3** units down and **4** units to the right to produce the graph of $y = g(x)$. Which equation defines function g ?

- A. $g(x) = \frac{a-19}{x+4} + 2$
- B. $g(x) = \frac{a-19}{x-4} + 2$
- C. $g(x) = \frac{a-22}{x+4} + 5$
- D. $g(x) = \frac{a-22}{x-4} + 5$

Question ID feba5a37

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: feba5a37

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 429593eb

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 429593eb

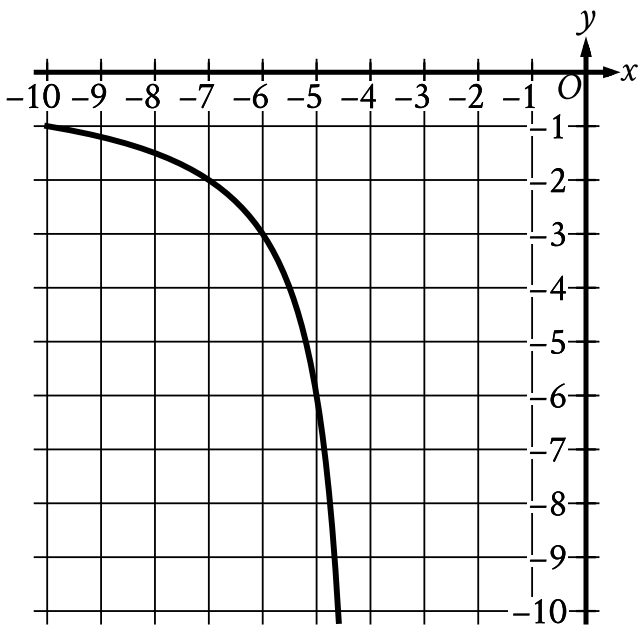
x	y
21	−8
23	8
25	−8

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 cec444a7

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: cec444a7



◀

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 3b0ffb71

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 3b0ffb71

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 $(0, -\frac{75}{7})$. The product of a and b is $\frac{320}{7}$. What is the value of a ?

Question ID 55087e8b

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Advanced Math	Nonlinear functions	

ID: 55087e8b

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**