

High Difficulty Algebra Packet

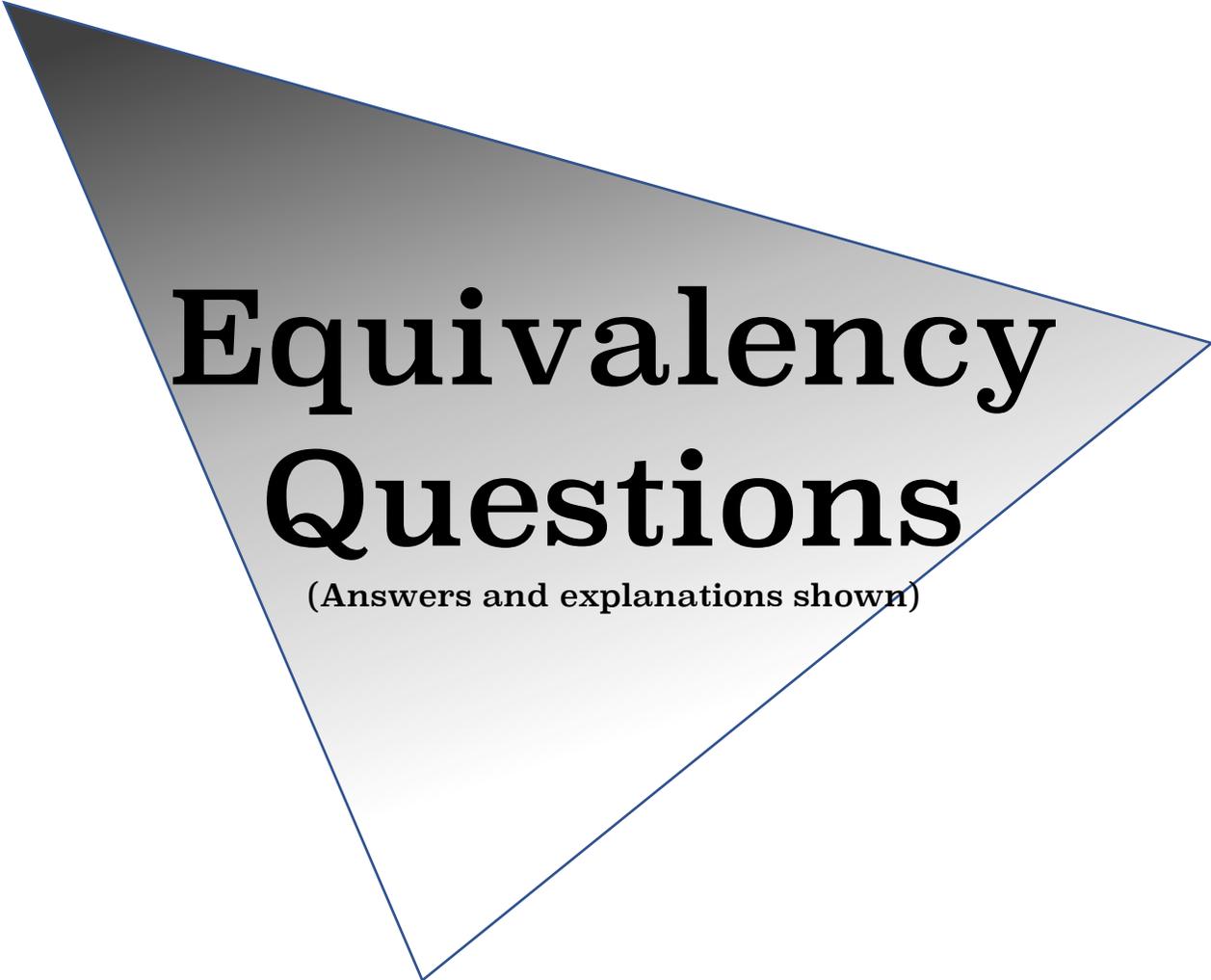
~Problems involving unknown constants~
~Questions Sourced from College Board ~

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Equivalency Questions

(Answers and explanations shown)

Question ID e117d3b8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: e117d3b8

If a and c are positive numbers, which of the following is

equivalent to $\sqrt{(a+c)^3} \cdot \sqrt{a+c}$?

- A. $a+c$
- B. a^2+c^2
- C. $a^2+2ac+c^2$
- D. a^2c^2

Question ID c81b6c57

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: c81b6c57

In the expression $3(2x^2 + px + 8) - 16x(p + 4)$, p is a constant. This expression is equivalent to the expression $6x^2 - 155x + 24$. What is the value of p ?

- A. -3
- B. 7
- C. 13
- D. 155

Question ID ea6d05bb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■ ■ ■

ID: ea6d05bb

The expression $(3x - 23)(19x + 6)$ is equivalent to the expression $ax^2 + bx + c$, where a , b , and c are constants. What is the value of b ?

Question ID a0b4103e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: a0b4103e

The expression $\frac{1}{3}x^2 - 2$ can be rewritten as $\frac{1}{3}(x - k)(x + k)$, where k is a positive constant. What is the value of k ?

- A. 2
- B. 6
- C. $\sqrt{2}$
- D. $\sqrt{6}$

Question ID 161126cf

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

ID: 161126cf

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

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 ad038c19

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: ad038c19

Which of the following is

equivalent to $\left(a + \frac{b}{2}\right)^2$?

A. $a^2 + \frac{b^2}{2}$

B. $a^2 + \frac{b^2}{4}$

C. $a^2 + \frac{ab}{2} + \frac{b^2}{2}$

D. $a^2 + ab + \frac{b^2}{4}$

Question ID 5355c0ef

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: 5355c0ef

$$0.36x^2 + 0.63x + 1.17$$

The given expression can be rewritten as $a(4x^2 + 7x + 13)$, where a is a constant. What is the value of a ?

Question ID f89e1d6f

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	———— • ———— ————

ID: f89e1d6f

If $a = c + d$, which of the following is equivalent to the expression $x^2 - c^2 - 2cd - d^2$?

- A. $(x + a)^2$
- B. $(x - a)^2$
- C. $(x + a)(x - a)$
- D. $x^2 - ax - a^2$

Question ID 371cbf6b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	

ID: 371cbf6b

$$(ax + 3)(5x^2 - bx + 4) = 20x^3 - 9x^2 - 2x + 12$$

The equation above is true for all x , where a and b are constants. What is the value of ab ?

- A. 18
- B. 20
- C. 24
- D. 40

Question ID 12e7faf8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: 12e7faf8

The equation $\frac{x^2+6x-7}{x+7} = ax+d$ is true for all $x \neq -7$, where a and d are integers. What is the value of $a+d$?

- A. -6
- B. -1
- C. 0
- D. 1

Question ID 34847f8a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: 34847f8a

$$\frac{2}{x-2} + \frac{3}{x+5} = \frac{rx+t}{(x-2)(x+5)}$$

The equation above is true for all $x > 2$, where r and t are positive constants. What is the value of rt ?

- A. -20
- B. 15
- C. 20
- D. 60

Question ID 137cc6fd

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	■■■

ID: 137cc6fd

$$\sqrt[5]{70n} \left(\sqrt[5]{70n} \right)^2$$

For what value of x is the given expression equivalent to $(70n)^{30x}$, where $n > 1$?

Question ID d8789a4c

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	

ID: d8789a4c

$$\frac{x^2 - c}{x - b}$$

In the expression above, b and c are positive integers. If the expression is equivalent to $x + b$ and $x \neq b$, which of the following could be the value of c ?

- A. 4
- B. 6
- C. 8
- D. 10

Question ID 40c09d66

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: 40c09d66

$$\frac{\sqrt{x^5}}{\sqrt[3]{x^4}} = x^{\frac{a}{b}}$$

If $\frac{\sqrt{x^5}}{\sqrt[3]{x^4}} = x^{\frac{a}{b}}$ for all positive values of x ,

what is the value of $\frac{a}{b}$?

Question ID c6e85cd7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: c6e85cd7

If $4^{8c} = \sqrt[3]{4^7}$, what is the value of c ?

Question ID 20291f47

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: 20291f47

Which expression is equivalent to $\frac{y+12}{x-8} + \frac{y(x-8)}{x^2y-8xy}$?

- A. $\frac{xy+y+4}{x^2y-16x^2y+64xy}$
- B. $\frac{xy+0y+12}{x^2y-8xy+x-8}$
- C. $\frac{xy^2+13xy-8y}{x^2y-8xy}$
- D. $\frac{xy^2+13xy-5y}{x^2y-16x^2y+64xy}$

Question ID ffdbcad4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: ffdbcad4

The expression $4x^2 + bx - 45$, where b is a constant, can be rewritten as $(hx + k)(x + j)$, where h , k , and j are integer constants. Which of the following must be an integer?

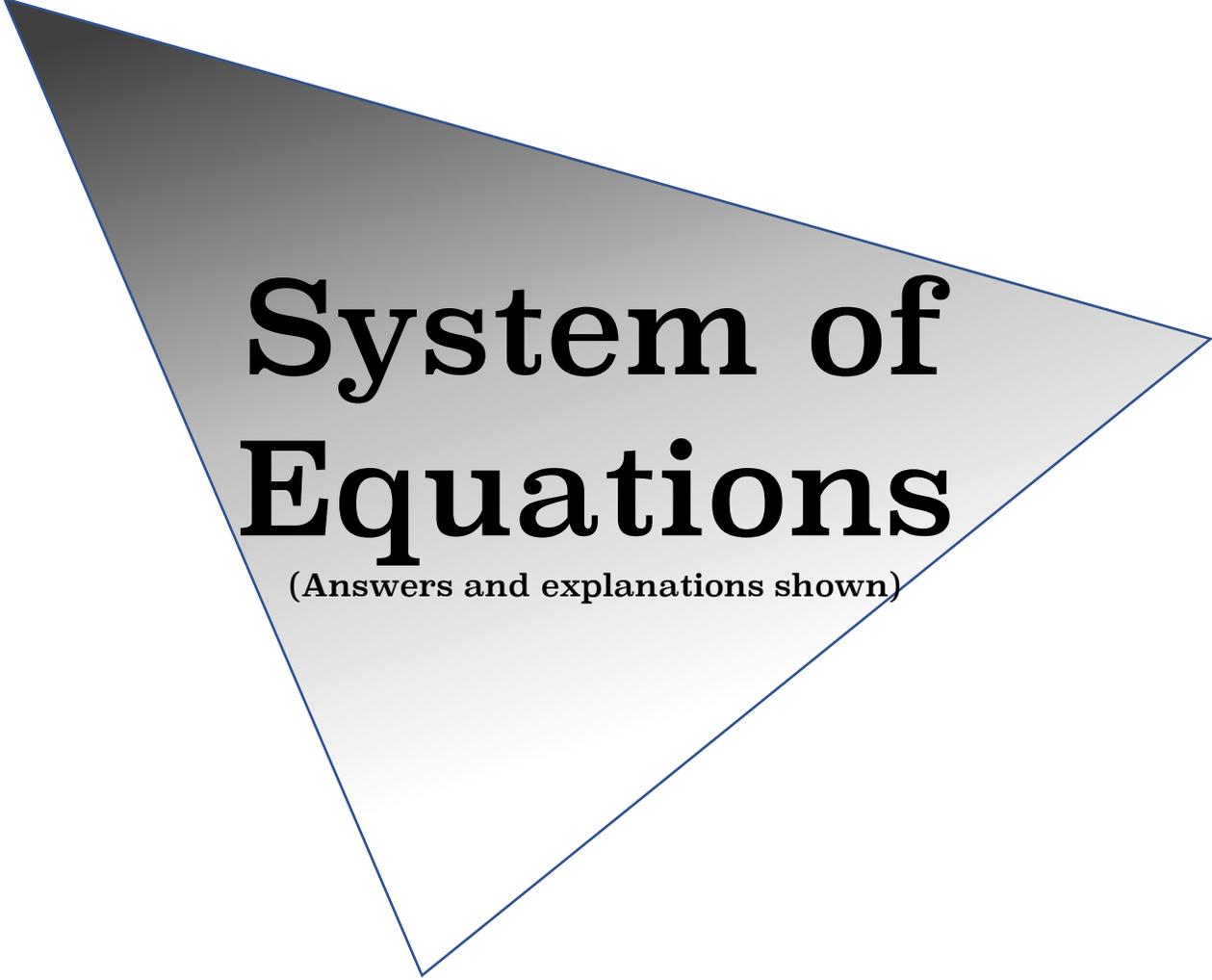
- A. $\frac{b}{h}$
- B. $\frac{b}{k}$
- C. $\frac{45}{h}$
- D. $\frac{45}{k}$

Question ID b74f2feb

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	—————

ID: b74f2feb

The expression $6\sqrt[5]{3^5x^{45}} \cdot \sqrt[5]{2^8x}$ is equivalent to ax^b , where a and b are positive constants and $x > 1$. What is the value of $a + b$?



System of Equations

(Answers and explanations shown)

Question ID 77c0cced

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 77c0cced

$$y = 2x^2 - 21x + 64$$
$$y = 3x + a$$

In the given system of equations, a is a constant. The graphs of the equations in the given system intersect at exactly one point, (x, y) , in the xy -plane. What is the value of x ?

- A. -8
- B. -6
- C. 6
- D. 8

Choice D is incorrect and may result from conceptual or calculation errors.

Question ID 2cb17792

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 2cb17792

$$y + k = x + 26$$

$$y - k = x^2 - 5x$$

In the given system of equations, k is a constant. The system has exactly one distinct real solution. What is the value of k ?

Question ID 9cb9beec

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 9cb9beec

$$y = -1.5$$
$$y = x^2 + 8x + a$$

In the given system of equations, a is a positive constant. The system has exactly one distinct real solution. What is the value of a ?

Question ID a54753ca

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: a54753ca

In the xy -plane, the graph of the equation $y = -x^2 + 9x - 100$ intersects the line $y = c$ at exactly one point. What is the value of c ?

- A. $-\frac{481}{4}$
- B. -100
- C. $-\frac{319}{4}$
- D. $-\frac{1}{2}$

ID: a54753ca Answer

Question ID f5aa5040

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: f5aa5040

In the xy -plane, a line with equation $2y = c$ for some constant c intersects a parabola at exactly one point. If the parabola has equation $y = -2x^2 + 9x$, what is the value of c ?

Question ID fc3d783a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: fc3d783a

In the xy -plane, a line with equation $2y = 4.5$ intersects a parabola at exactly one point. If the parabola has equation $y = -4x^2 + bx$, where b is a positive constant, what is the value of b ?

Question ID 1b1deebe

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 1b1deebe

$$ax + by = 72$$

$$6x + 2by = 56$$

In the given system of equations, a and b are constants. The graphs of these equations in the xy -plane intersect at the point $(4, y)$. What is the value of a ?

- A. 3
- B. 4
- C. 6
- D. 14

Question ID 14360f84

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 14360f84

$$4x - 9y = 9y + 5$$

$$hy = 2 + 4x$$

In the given system of equations, h is a constant. If the system has no solution, what is the value of h ?

- A. -9
- B. 0
- C. 9
- D. 18

Question ID f75bd744

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: f75bd744

$$4x - 6y = 10y + 2$$

$$ty = \frac{1}{2} + 2x$$

In the given system of equations, t is a constant. If the system has no solution, what is the value of t ?

Question ID b5f62071

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: b5f62071

$$48x - 64y = 48y + 24$$

$$ry = \frac{1}{8} - 12x$$

In the given system of equations, r is a constant. If the system has no solution, what is the value of r ?

Question ID 45a534d0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	—————

ID: 45a534d0

$$48x - 72y = 30y + 24$$

$$ry = \frac{1}{6} - 16x$$

In the given system of equations, r is a constant. If the system has no solution, what is the value of r ?

Question ID 36fd6752

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	_____

ID: 36fd6752

$$\begin{aligned}6 + 7r &= pw \\ 7r - 5w &= 5w + 11\end{aligned}$$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p ?

Question ID ff501705

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	—————

ID: ff501705

$$\begin{aligned}\frac{3}{2}y - \frac{1}{4}x &= \frac{2}{3} - \frac{3}{2}y \\ \frac{1}{2}x + \frac{3}{2} &= py + \frac{9}{2}\end{aligned}$$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p ?

Question ID 59352689

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	—————

ID: 59352689

$$\begin{aligned}\frac{7}{8}y - \frac{5}{8}x &= \frac{4}{7} - \frac{7}{8}y \\ \frac{5}{4}x + \frac{7}{4} &= py + \frac{15}{4}\end{aligned}$$

In the given system of equations, p is a constant. If the system has no solution, what is the value of p ?

Question ID 571174f3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: 571174f3

$$\begin{aligned}\frac{2}{5}x + \frac{7}{5}y &= \frac{2}{7} \\ gx + ky &= \frac{5}{2}\end{aligned}$$

In the given system of equations, g and k are constants. The system has infinitely many solutions. What is the value of $\frac{g}{k}$?

Question ID a35c7164

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in two variables	

ID: a35c7164

$$5x + 7y = 1$$

$$ax + by = 1$$

In the given pair of equations, a and b are constants. The graph of this pair of equations in the xy -plane is a pair of perpendicular lines. Which of the following pairs of equations also represents a pair of perpendicular lines?

- A. $10x + 7y = 1$
 $ax - 2by = 1$
- B. $10x + 7y = 1$
 $ax + 2by = 1$
- C. $10x + 7y = 1$
 $2ax + by = 1$
- D. $5x - 7y = 1$
 $ax + by = 1$

Question ID f03465dc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	

ID: f03465dc

$$\begin{aligned}8x + 7y &= 9 \\ 24x + 21y &= 27\end{aligned}$$

For each real number r , which of the following points lies on the graph of each equation in the xy -plane for the given system?

- A. $(r, -\frac{8r}{7} + \frac{9}{7})$
- B. $(-\frac{8r}{7} + \frac{9}{7}, r)$
- C. $(-\frac{8r}{7} + 9, \frac{8r}{7} + 27)$
- D. $(\frac{r}{3} + 9, -\frac{r}{3} + 27)$

Question ID 979c6ebc

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	—————

ID: 979c6ebc

$$\begin{aligned}7x + 6y &= 5 \\ 28x + 24y &= 20\end{aligned}$$

For each real number r , which of the following points lies on the graph of each equation in the xy -plane for the given system?

- A. $(r, -\frac{6r}{7} + \frac{5}{7})$
- B. $(r, \frac{7r}{6} + \frac{5}{6})$
- C. $(\frac{r}{4} + 5, -\frac{r}{4} + 20)$
- D. $(-\frac{6r}{7} + \frac{5}{7}, r)$

Question ID 75012ee7

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Systems of two linear equations in two variables	—————

ID: 75012ee7

$$\begin{aligned}2x + 3y &= 7 \\ 10x + 15y &= 35\end{aligned}$$

For each real number r , which of the following points lies on the graph of each equation in the xy -plane for the given system?

- A. $(\frac{r}{5} + 7, -\frac{r}{5} + 35)$
- B. $(-\frac{3r}{2} + \frac{7}{2}, r)$
- C. $(r, \frac{2r}{3} + \frac{7}{3})$
- D. $(r, -\frac{3r}{2} + \frac{7}{2})$

Question ID 3f8a701b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 3f8a701b

The equation $9x + 5 = a(x + b)$, where a and b are constants, has no solutions. Which of the following must be true?

I. $a = 9$

II. $b = 5$

III. $b \neq \frac{5}{9}$

A. None

B. I only

C. I and II only

D. I and III only

Question ID 7d5d1b32

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■ ■ ■

ID: 7d5d1b32

$$2(kx - n) = -\frac{28}{15}x - \frac{36}{19}$$

In the given equation, k and n are constants and $n > 1$. The equation has no solution. What is the value of k ?

Question ID 153ee763

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: 153ee763

$$-3x + 21px = 84$$

In the given equation, p is a constant. The equation has no solution. What is the value of p ?

- A. 0
- B. $\frac{1}{7}$
- C. $\frac{4}{3}$
- D. 4

Question ID e6cb2402

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	

ID: e6cb2402

$$3(kx + 13) = \frac{48}{17}x + 36$$

In the given equation, k is a constant. The equation has no solution. What is the value of k ?

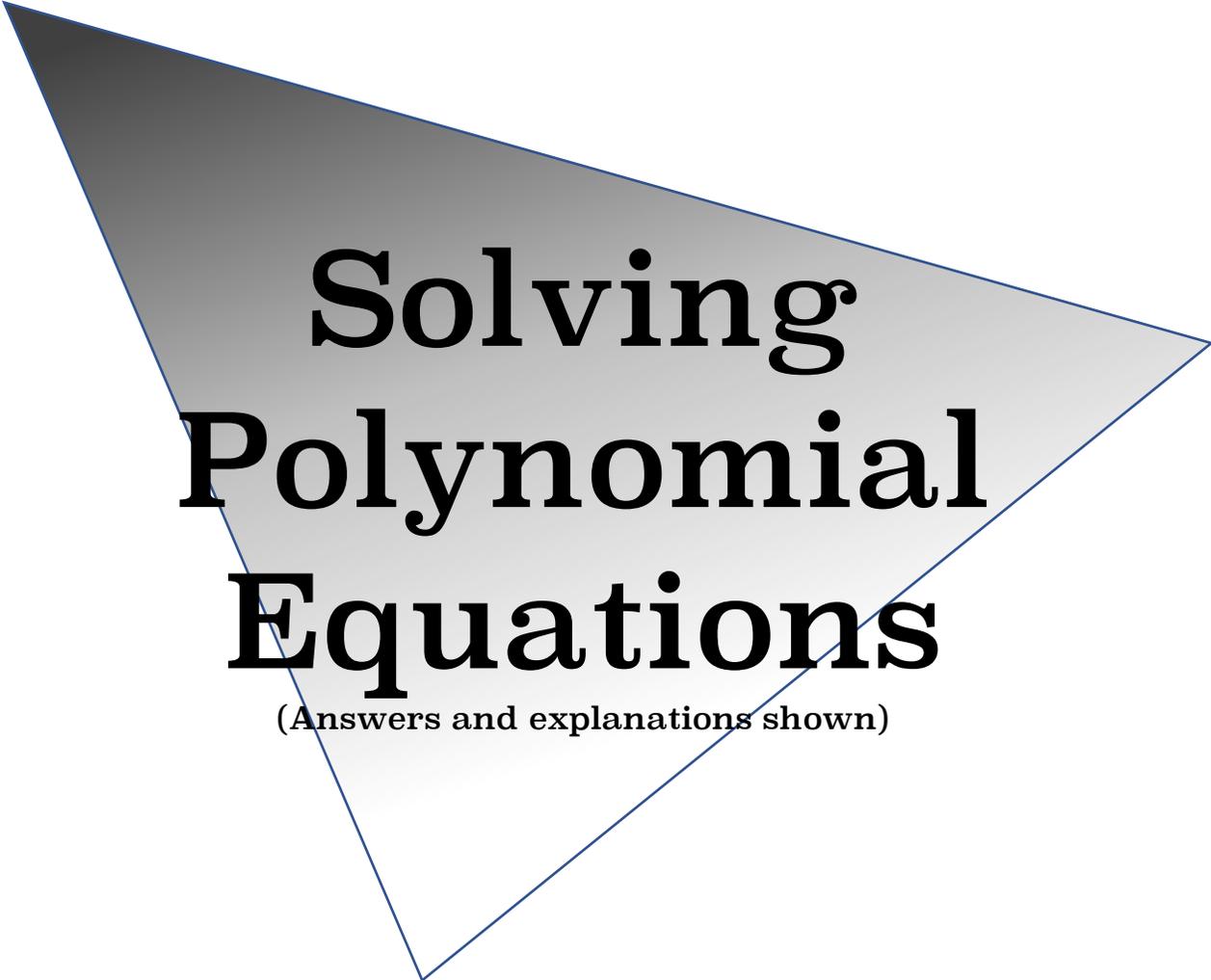
Question ID ac472881

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear equations in one variable	■ ■ ■

ID: ac472881

$$\frac{12x+28}{4} - \frac{s}{13} = r(x-8)$$

In the given equation, s and r are constants, and $s > 0$. If the equation has infinitely many solutions, what is the value of s ?



Solving Polynomial Equations

(Answers and explanations shown)

Question ID e11294f9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: e11294f9

The solutions to $x^2 + 6x + 7 = 0$ are r and s , where $r < s$. The solutions to $x^2 + 8x + 8 = 0$ are t and u , where $t < u$. The solutions to $x^2 + 14x + c = 0$, where c is a constant, are $r + t$ and $s + u$. What is the value of c ?

Question ID 7bd10ef3

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: 7bd10ef3

$$2x^2 - 4x = t$$

In the equation above, t is a constant. If the equation has no real solutions, which of the following could be the value of t ?

- A. -3
- B. -1
- C. 1
- D. 3

Question ID 88a0c425

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: 88a0c425

$$-2x^2 + 20x + c = 0$$

In the given equation, c is a constant. The equation has exactly one solution. What is the value of c ?

- A. -68
- B. -50
- C. -32
- D. 0

Question ID 6011a3f8

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 6011a3f8

$$64x^2 + bx + 25 = 0$$

In the given equation, b is a constant. For which of the following values of b will the equation have more than one real solution?

- A. -91
- B. -80
- C. 5
- D. 40

Question ID 1fe32f7d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 1fe32f7d

$$-x^2 + bx - 676 = 0$$

In the given equation, b is a positive integer. The equation has no real solution. What is the greatest possible value of b ?

Question ID 3d12b1e0

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	

ID: 3d12b1e0

$$-16x^2 - 8x + c = 0$$

In the given equation, c is a constant. The equation has exactly one solution. What is the value of c ?

Question ID 03ff48d2

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■ ■ ■

ID: 03ff48d2

$$x(kx - 56) = -16$$

In the given equation, k is an integer constant. If the equation has no real solution, what is the least possible value of k ?

Question ID 2c288148

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 2c288148

$$\sqrt{k-x} = 58 - x$$

In the given equation, k is a constant. The equation has exactly one real solution. What is the minimum possible value of $4k$?

Question ID ebb717ab

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: ebb717ab

$$x^2 - 34x + c = 0$$

In the given equation, c is a constant. The equation has no real solutions if $c > n$. What is the least possible value of n ?

Question ID fbb96bb1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■■■

ID: fbb96bb1

$$x - 29 = (x - a)(x - 29)$$

Which of the following are solutions to the given equation, where a is a constant and $a > 30$?

- I. a
 - II. $a + 1$
 - III. 29
- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II, and III

Question ID 104bff62

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■

ID: 104bff62

$$\frac{x^2}{\sqrt{x^2-c^2}} = \frac{c^2}{\sqrt{x^2-c^2}} + 39$$

In the given equation, c is a positive constant. Which of the following is one of the solutions to the given equation?

- A. $-c$
- B. $-c^2 - 39^2$
- C. $-\sqrt{39^2 - c^2}$
- D. $-\sqrt{c^2 + 39^2}$

Question ID 9f2ecade

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

ID: 9f2ecade

$$h(x) = x^3 + ax^2 + bx + c$$

The function h is defined above, where a , b , and c are integer constants. If the zeros of the function are -5 , 6 , and 7 , what is the value of c ?

Question ID 5edc8c98

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	■■■■■

ID: 5edc8c98

$$64x^2 - (16a + 4b)x + ab = 0$$

In the given equation, a and b are positive constants. The sum of the solutions to the given equation is $k(4a + b)$, where k is a constant. What is the value of k ?

Question ID 2c05d312

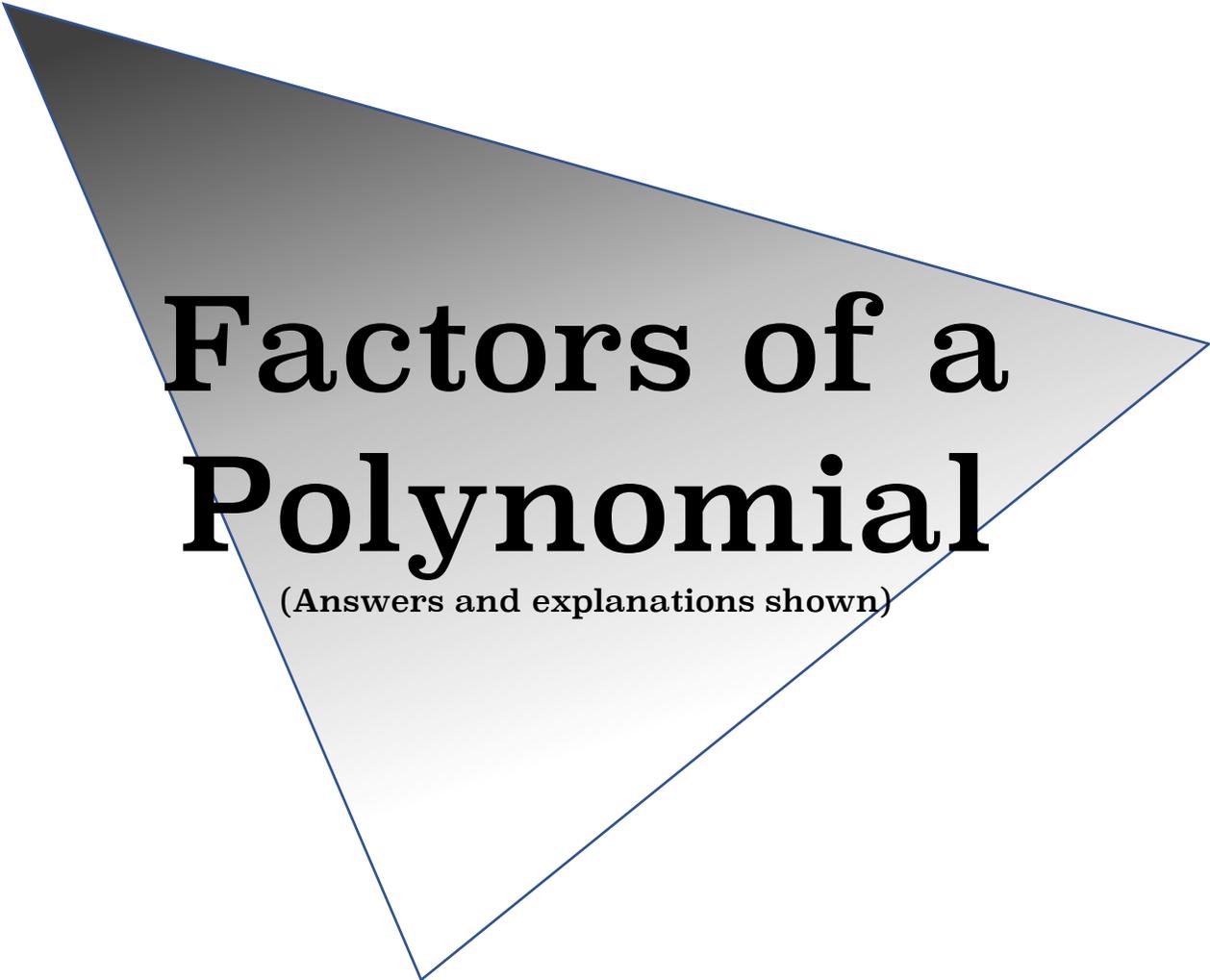
Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear equations in one variable and systems of equations in two variables	—————

ID: 2c05d312

$$57x^2 + (57b + a)x + ab = 0$$

In the given equation, a and b are positive constants. The product of the solutions to the given equation is kab , where k is a constant. What is the value of k ?

- A. $\frac{1}{57}$
- B. $\frac{1}{19}$
- C. 1
- D. 57



Factors of a Polynomial

(Answers and explanations shown)

Question ID 42f8e4b4

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	

ID: 42f8e4b4

One of the factors of $2x^3 + 42x^2 + 208x$ is $x + b$, where b is a positive constant. What is the smallest possible value of b ?

Question ID 7355b9d9

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	————— ————— —————

ID: 7355b9d9

If $k - x$ is a factor of the expression $-x^2 + \frac{1}{29}nk^2$, where n and k are constants and $k > 0$, what is the value of n ?

- A. -29
- B. $-\frac{1}{29}$
- C. $\frac{1}{29}$
- D. 29

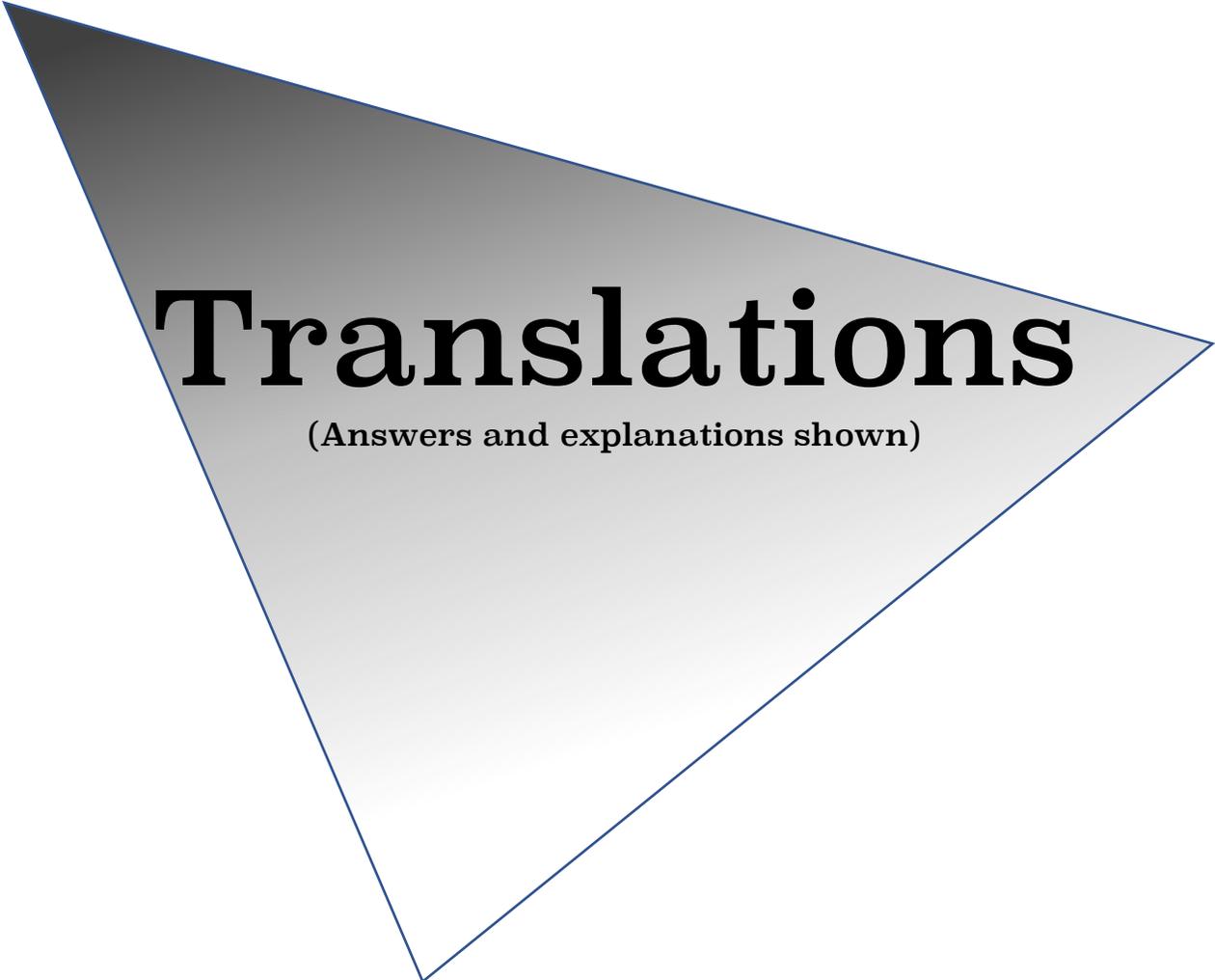
Question ID e51bf5b1

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Equivalent expressions	

ID: e51bf5b1

Which of the following expressions has a factor of $x + 2b$, where b is a positive integer constant?

- A. $3x^2 + 7x + 14b$
- B. $3x^2 + 28x + 14b$
- C. $3x^2 + 42x + 14b$
- D. $3x^2 + 49x + 14b$



Translations

(Answers and explanations shown)

Question ID 40491607

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

ID: 40491607

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

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 a45ffacb

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

ID: a45ffacb

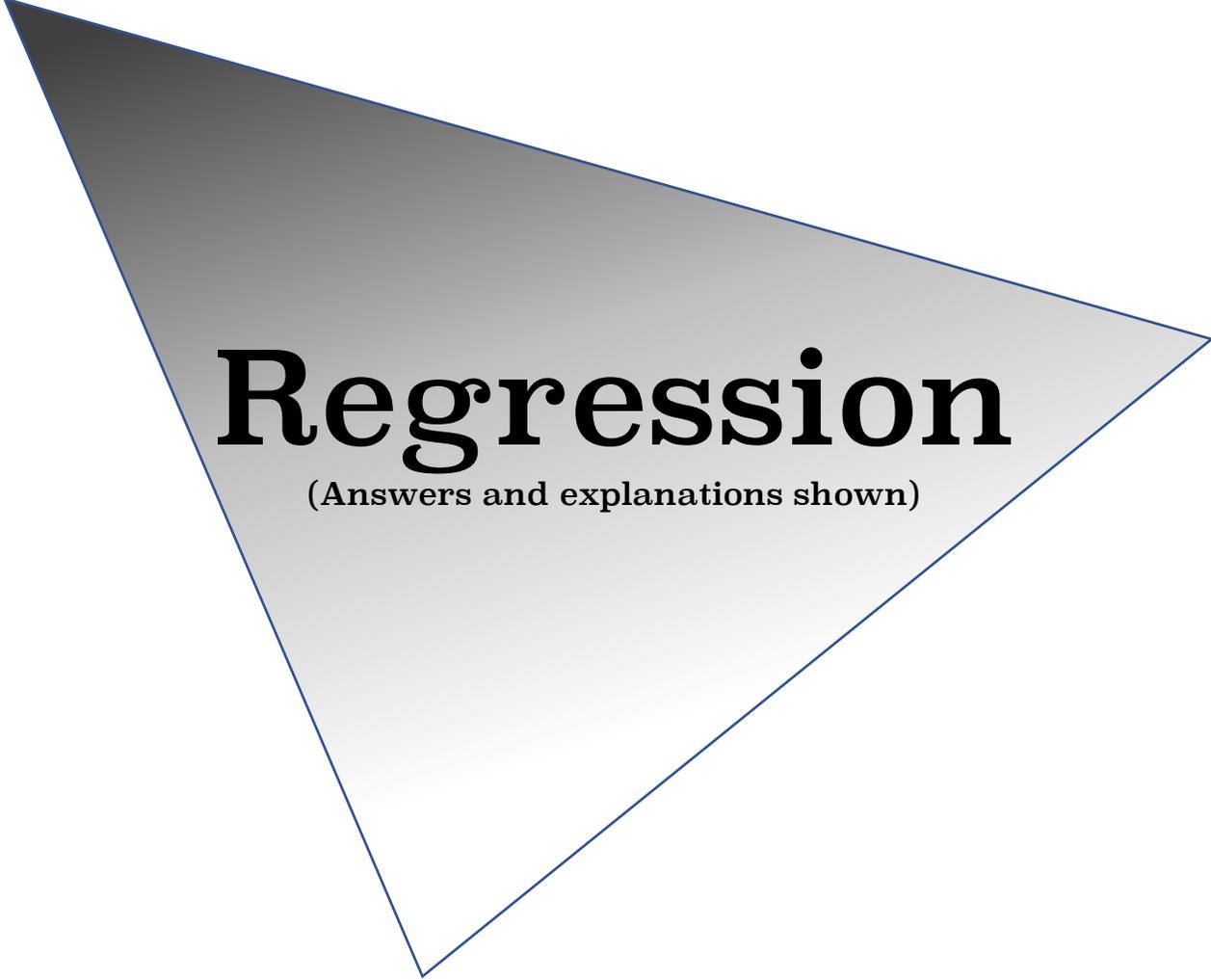
Function f is defined by $f(x) = -a^x + b$, where a and b are constants. In the xy -plane, the graph of $y = f(x) - 15$ has a y -intercept at $(0, -\frac{99}{7})$. The product of a and b is $\frac{65}{7}$. What is the value of a ?

Question ID b8f13a3a

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

ID: b8f13a3a

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 ?



Regression

(Answers and explanations shown)

Question ID 821e724e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 821e724e

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 4a0d0399

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

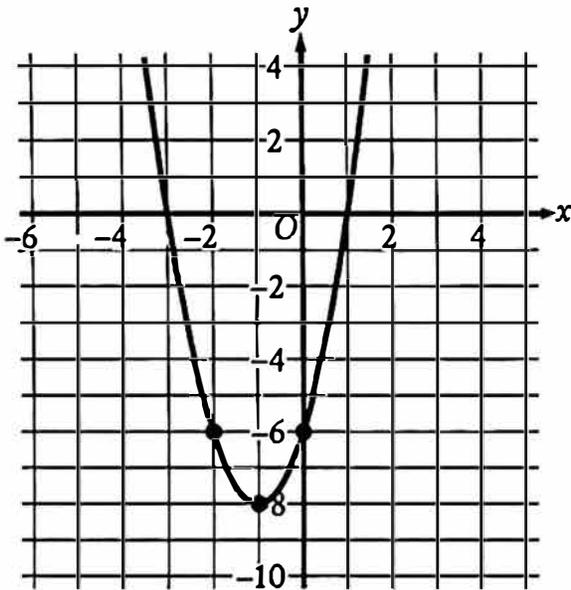
ID: 4a0d0399

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 09d21d79

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

ID: 09d21d79



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

Question ID 55c5d3c2

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

ID: 55c5d3c2

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 9f2ecade

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

ID: 9f2ecade

$$h(x) = x^3 + ax^2 + bx + c$$

The function h is defined above, where a , b , and c are integer constants. If the zeros of the function are -5 , 6 , and 7 , what is the value of c ?

Question ID de39858a

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: de39858a

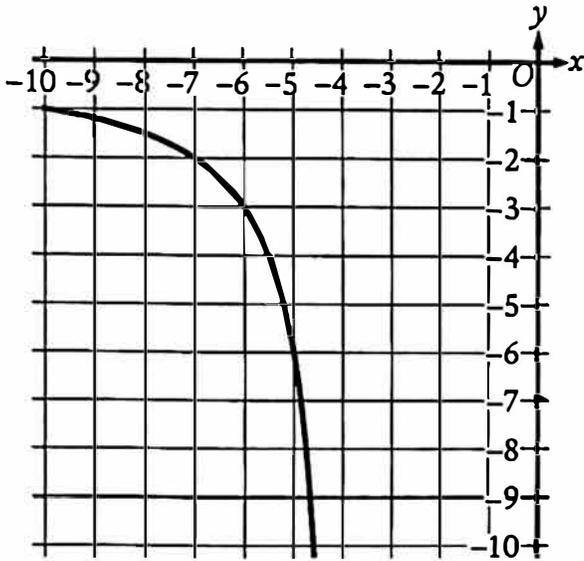
The function h is defined by $h(x) = a^x + b$, where a and b are positive constants. The graph of $y = h(x)$ in the xy -plane passes through the points $(0, 10)$ and $(-2, \frac{325}{36})$. What is the value of ab ?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. 54
- D. 60

Question ID 4d037075

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

ID: 4d037075



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 43926bd9

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

ID: 43926bd9

x	$f(x)$
1	a
2	a^5
3	a^9

For the exponential function f , the table above shows several values of x and their corresponding values of $f(x)$, where a is a constant greater than 1. If k is a constant and $f(k) = a^{29}$, what is the value of k ?

Question ID d41cf4d3

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

ID: d41cf4d3

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 02060533

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

ID: 02060533

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 4dd4efcf

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

ID: 4dd4efcf

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

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 95eeeb5b

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

ID: 95eeeb5b

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

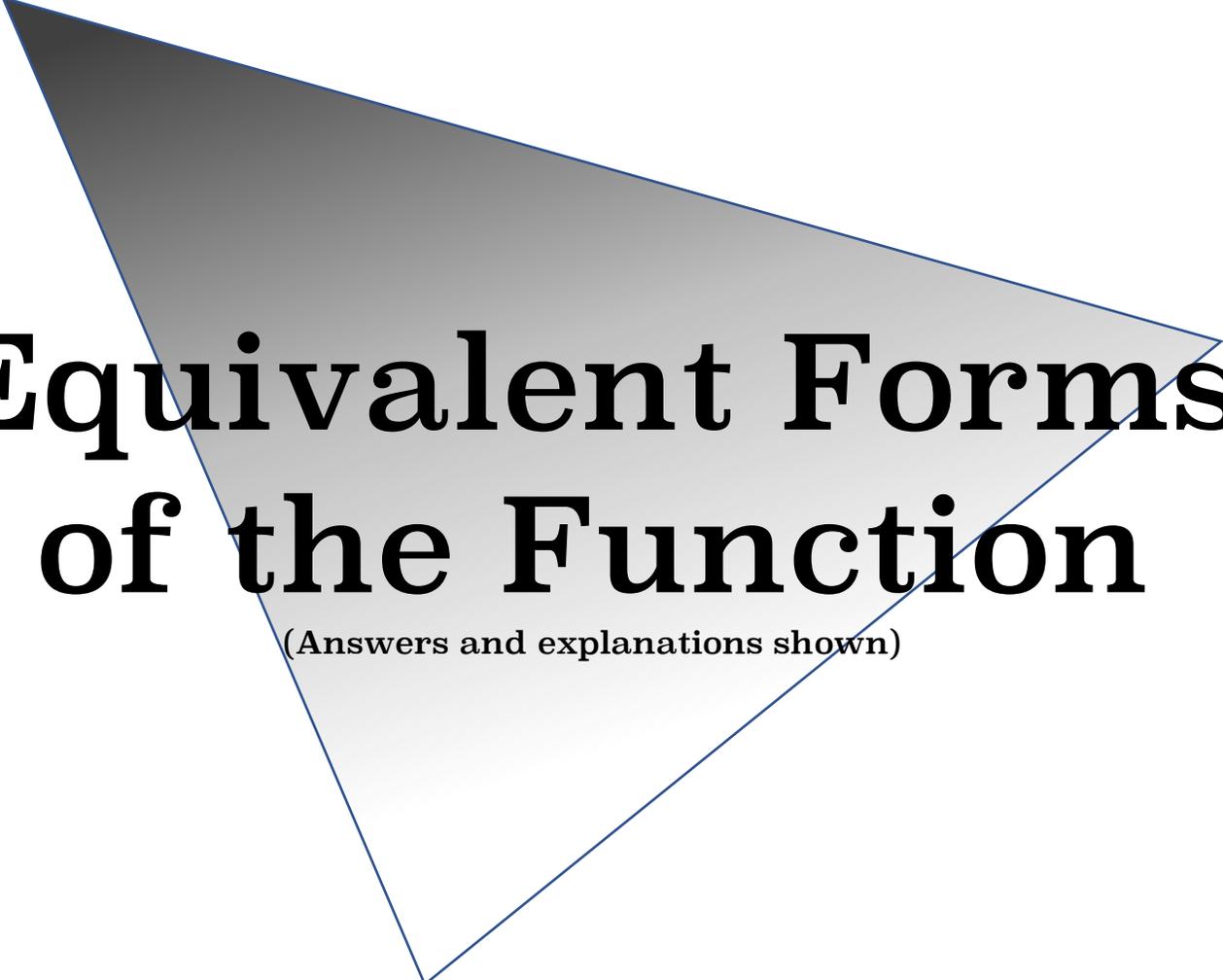
Question ID 92f812bb

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

ID: 92f812bb

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



Equivalent Forms of the Function

(Answers and explanations shown)

Question ID 08d03fe4

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

ID: 08d03fe4

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 70fb357b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

ID: 70fb357b

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

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 781c2f6e

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Advanced Math	Nonlinear functions	

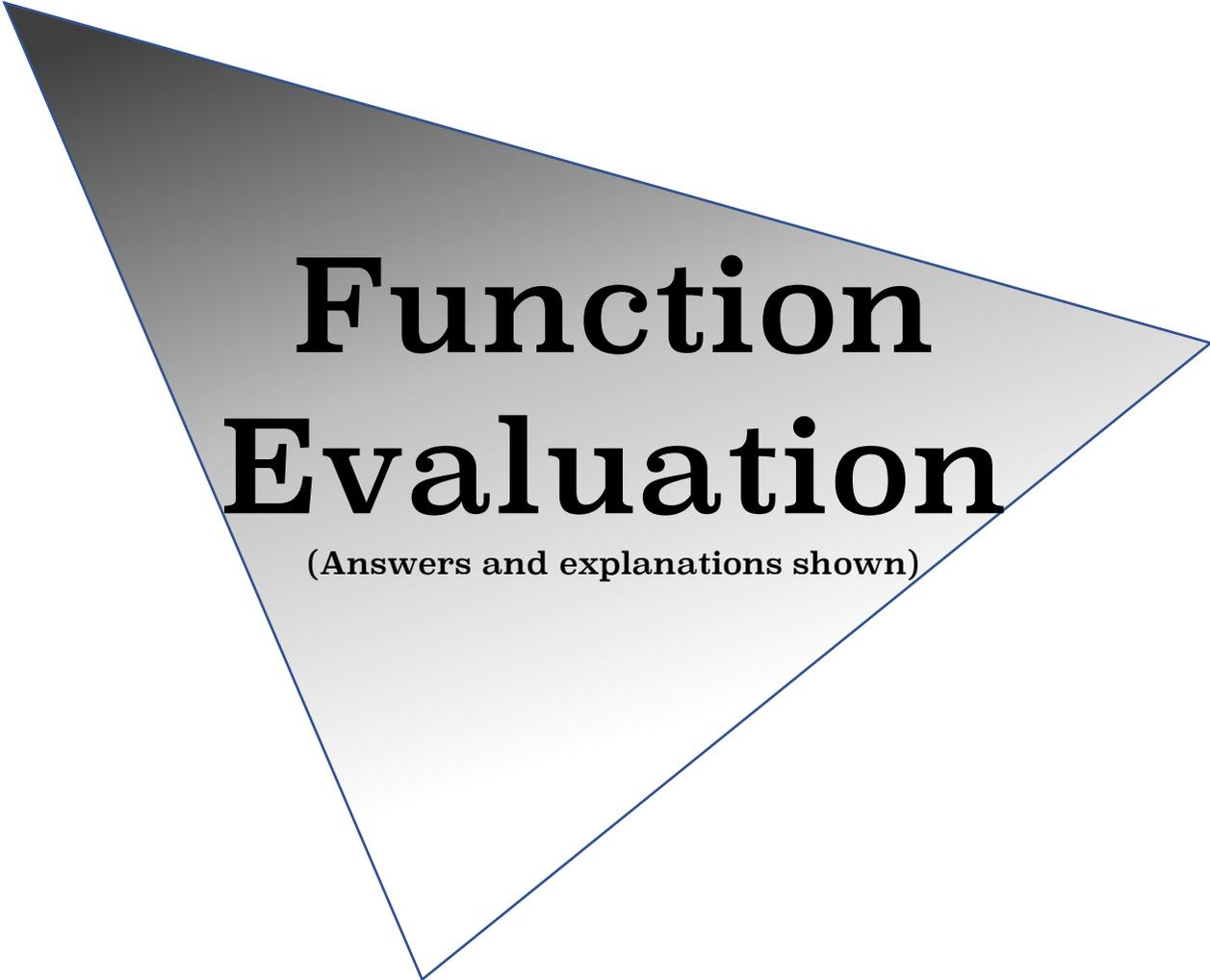
ID: 781c2f6e

The function f is defined by $f(x) = a(2 \cdot 2^x + 2 \cdot 2^b)$, 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. $g(x) = a(2 \cdot 2^x + k)$

II. $h(x) = a(2 \cdot 2)^x + m$

- A. I only
- B. II only
- C. I and II
- D. Neither I nor II



Function Evaluation

(Answers and explanations shown)

Question ID 6e7ae9fc

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

ID: 6e7ae9fc

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 2f51abc2

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

ID: 2f51abc2

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

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 a5882327

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	_____

ID: a5882327

The linear function g is defined by $g(x) = b - 15x$, where b is a constant. If $g(c + 7) = \frac{c}{4}$, where c is a constant, which of the following expressions represents the value of b ?

- A. $\frac{15c}{4}$
- B. $\frac{19c}{4} + 7$
- C. $\frac{61c}{4} + 105$
- D. $15c + 105$

Question ID 0b0fa68b

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 0b0fa68b

For the function f , $f(cx) = x - 8$ for all values of x , where c is a positive constant. If $f(2) = 35$, what is the value of c ?

Question ID ce508fb0

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

ID: ce508fb0

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

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

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

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

Question ID 128c75e2

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

ID: 128c75e2

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 023c0a8d

Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Algebra	Linear functions	

ID: 023c0a8d

For the function f , if $f(3x) = x - 6$ for all values of x ,
what is the value of $f(6)$?

- A. -6
- B. -4
- C. 0
- D. 2