Question ID 7f4b32e1

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

$$g(x) = \tfrac{3}{5}x + \tfrac{7}{6}$$
$$h(x) = 6x - 5$$

The functions g and h are defined by the equations shown. Which expression is equivalent to $g(x) \cdot h(x)$?

A. $\dfrac{18x^2}{5} - \dfrac{35}{6}$

B. $\dfrac{18x^2}{5} + \dfrac{27x}{11} - \dfrac{35}{6}$

C. $\dfrac{18x^2}{5} - 4x - \dfrac{35}{6}$

D. $\dfrac{18x^2}{5} + 4x - \dfrac{35}{6}$

Correct Answer: D

Rationale

Choice D is correct. It's given that $g(x) = \tfrac{3}{5}x + \tfrac{7}{6}$ and $h(x) = 6x - 5$. Substituting $\tfrac{3}{5}x + \tfrac{7}{6}$ for $g(x)$ and $6x - 5$ for $h(x)$ in the expression $g(x) \cdot h(x)$ yields $\left(\tfrac{3}{5}x + \tfrac{7}{6}\right)(6x - 5)$. This expression can be rewritten as $\tfrac{3}{5}x(6x - 5) + \tfrac{7}{6}(6x - 5)$, or $\tfrac{18x^2}{5} - 3x + 7x - \tfrac{35}{6}$, which is equivalent to $\tfrac{18x^2}{5} + 4x - \tfrac{35}{6}$.

Choice A is incorrect. This expression is equivalent to $\tfrac{3}{5}x(6x) + \tfrac{7}{6}(-5)$, not $\left(\tfrac{3}{5}x + \tfrac{7}{6}\right)(6x - 5)$.

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

Choice C is incorrect. This expression is equivalent to $\left(\tfrac{3}{5}x - \tfrac{7}{6}\right)(6x + 5)$, not $\left(\tfrac{3}{5}x + \tfrac{7}{6}\right)(6x - 5)$.

Question Difficulty: Medium

Question ID bc68d9f9

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

Which expression is equivalent to $6x^8y^2 + 12x^2y^2$?

A. $6x^2y^2(2x^6)$

B. $6x^2y^2(x^4)$

C. $6x^2y^2(x^6 + 2)$

D. $6x^2y^2(x^4 + 2)$

Correct Answer: C

Rationale

Choice C is correct. Since each term of the given expression has a common factor of $6x^2y^2$, it may be rewritten as $6x^2y^2(x^6) + 6x^2y^2(2)$, or $6x^2y^2(x^6 + 2)$.

Choice A is incorrect. This expression is equivalent to $12x^8y^2$, not $6x^8y^2 + 12x^2y^2$.

Choice B is incorrect. This expression is equivalent to $6x^6y^2$, not $6x^8y^2 + 12x^2y^2$.

Choice D is incorrect. This expression is equivalent to $6x^6y^2 + 12x^2y^2$, not $6x^8y^2 + 12x^2y^2$.

Question Difficulty: Medium

Question ID eb385faa

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

Which expression is equivalent to $(7x^3 + 7x) - (6x^3 - 3x)$?

A. $x^3 + 10x$

B. $-13x^3 + 10x$

C. $-13x^3 + 4x$

D. $x^3 + 4x$

Correct Answer: A

Rationale

Choice A is correct. Applying the distributive property, the given expression can be written as $7x^3 + 7x - 6x^3 + 3x$. Grouping like terms in this expression yields $(7x^3 - 6x^3) + (7x + 3x)$. Combining like terms in this expression yields $x^3 + 10x$.

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

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

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

Question Difficulty: Medium

Question ID 219a57aa

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

ID: 219a57aa

Which expression represents the product of $\left(x^{-6}y^3z^5\right)$ and $\left(x^4z^5 + y^8z^{-7}\right)$?

A. $x^{-2}z^{10} + y^{11}z^{-2}$

B. $x^{-2}z^{10} + x^{-6}z^{-2}$

C. $x^{-2}y^3z^{10} + y^8z^{-7}$

D. $x^{-2}y^3z^{10} + x^{-6}y^{11}z^{-2}$

ID: 219a57aa Answer

Correct Answer: D

Rationale

Choice D is correct. The product of $\left(x^{-6}y^3z^5\right)$ and $\left(x^4z^5 + y^8z^{-7}\right)$ can be represented by the expression $\left(x^{-6}y^3z^5\right)\left(x^4z^5 + y^8z^{-7}\right)$. Applying the distributive property to this expression yields $\left(x^{-6}y^3z^5\right)\left(x^4z^5\right) + \left(x^{-6}y^3z^5\right)\left(y^8z^{-7}\right)$, or $x^{-6}x^4y^3z^5z^5 + x^{-6}y^3y^8z^5z^{-7}$. This expression is equivalent to $x^{-6+4}y^3z^{5+5} + x^{-6}y^{3+8}z^{5-7}$, or $x^{-2}y^3z^{10} + x^{-6}y^{11}z^{-2}$.

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

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

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

Question Difficulty: Medium

Question ID 5e61ba73

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

The expression $90y^5 - 54y^4$ is equivalent to $ry^4(15y - 9)$, where r is a constant. What is the value of r?

Correct Answer: 6

Rationale

The correct answer is 6. Applying the distributive property to the expression $ry^4(15y - 9)$ yields $15ry^5 - 9ry^4$. Since $90y^5 - 54y^4$ is equivalent to $ry^4(15y - 9)$, it follows that $90y^5 - 54y^4$ is also equivalent to $15ry^5 - 9ry^4$. Since these expressions are equivalent, it follows that corresponding coefficients are equivalent. Therefore, $90 = 15r$ and $-54 = -9r$. Solving either of these equations for r will yield the value of r. Dividing both sides of $90 = 15r$ by 15 yields $6 = r$. Therefore, the value of r is 6.

Question Difficulty: Medium

Question ID 01264050

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

Which expression is equivalent to $(d - 6)(8d^2 - 3)$?

A. $8d^3 - 14d^2 - 3d + 18$

B. $8d^3 - 17d^2 + 48$

C. $8d^3 - 48d^2 - 3d + 18$

D. $8d^3 - 51d^2 + 48$

ID: 01264050 Answer

Correct Answer: C

Rationale

Choice C is correct. Applying the distributive property to the given expression yields $d(8d^2 - 3) - 6(8d^2 - 3)$. Applying the distributive property once again to this expression yields $(d)(8d^2) + (d)(-3) + (-6)(8d^2) + (-6)(-3)$, or $8d^3 + (-3d) + (-48d^2) + 18$. This expression can be rewritten as $8d^3 - 48d^2 - 3d + 18$. Thus, $(d - 6)(8d^2 - 3)$ is equivalent to $8d^3 - 48d^2 - 3d + 18$.

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

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

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

Question Difficulty: Medium

Question ID 581be4a1

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

Which of the following expressions is equivalent to $8x^{10} - 8x^9 + 88x$?

A. $x(7x^{10} - 7x^9 + 87x)$

B. $x(8^{10} - 8^9 + 88)$

C. $8x(x^{10} - x^9 + 11x)$

D. $8x(x^9 - x^8 + 11)$

Correct Answer: D

Rationale

Choice D is correct. Since $8x$ is a common factor of each term in the given expression, the expression can be rewritten as $8x(x^9 - x^8 + 11)$.

Choice A is incorrect. This expression is equivalent to $7x^{11} - 7x^{10} + 87x^2$.

Choice B is incorrect. This expression is equivalent to $8^{10}x - 8^9x + 88x$.

Choice C is incorrect. This expression is equivalent to $8x^{11} - 8x^{10} + 88x^2$.

Question Difficulty: Medium

Question ID 3a7aa34d

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

Which expression is equivalent to $a^{\frac{11}{12}}$, where $a > 0$?

A. $\sqrt[12]{a^{132}}$

B. $\sqrt[144]{a^{132}}$

C. $\sqrt[121]{a^{132}}$

D. $\sqrt[11]{a^{132}}$

Correct Answer: B

Rationale

Choice B is correct. Since $\frac{12}{12} = 1$, multiplying the exponent of the given expression by $\frac{12}{12}$ yields an equivalent expression: $a^{\left(\frac{11}{12}\right)\left(\frac{12}{12}\right)} = a^{\left(\frac{132}{144}\right)}$. Since $\frac{132}{144} = 132\left(\frac{1}{144}\right)$, the expression $a^{\frac{132}{144}}$ can be rewritten as $a^{(132)\left(\frac{1}{144}\right)}$. Applying properties of exponents, this expression can be rewritten as $\left(a^{132}\right)^{\frac{1}{144}}$. An expression of the form $(m)^{\frac{1}{k}}$, where $m > 0$ and $k > 0$, is equivalent to $\sqrt[k]{m}$. Therefore, $\left(a^{132}\right)^{\frac{1}{144}}$ is equivalent to $\sqrt[144]{a^{132}}$.

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

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

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

Question Difficulty: Medium

Question ID a351b98d

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

The expression $\frac{24}{6x+42}$ is equivalent to $\frac{4}{x+b}$, where b is a constant and $x > 0$. What is the value of b?

A. 7

B. 10

C. 24

D. 252

Correct Answer: A

Rationale

Choice A is correct. Since the given expressions are equivalent and the numerator of the second expression is $\frac{1}{6}$ of the numerator of the first expression, the denominator of the second expression must also be $\frac{1}{6}$ of the denominator of the first expression. By the distributive property, $\frac{1}{6}(6x + 42)$ is equivalent to $\frac{1}{6}(6x) + \frac{1}{6}(42)$, or $x + 7$. Therefore, the value of b is 7.

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

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

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

Question Difficulty: Medium

Question ID 5883daba

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

ID: 5883daba

Which expression is equivalent to $(8x^3 + 8) - (x^3 - 2)$?

A. $8x^3 + 6$

B. $7x^3 + 10$

C. $8x^3 + 10$

D. $7x^3 + 6$

ID: 5883daba Answer

Correct Answer: B

Rationale

Choice B is correct. The given expression is equivalent to $8x^3 + 8 - x^3 - (-2)$, or $8x^3 + 8 - x^3 + 2$. Combining like terms in this expression yields $7x^3 + 10$.

Choice A is incorrect. This expression is equivalent to $(8x^3 + 8) - 2$, not $(8x^3 + 8) - (x^3 - 2)$.

Choice C is incorrect. This expression is equivalent to $(8x^3 + 8) - (-2)$, not $(8x^3 + 8) - (x^3 - 2)$.

Choice D is incorrect. This expression is equivalent to $(8x^3 + 8) - (x^3 + 2)$, not $(8x^3 + 8) - (x^3 - 2)$.

Question Difficulty: Medium

Question ID 27b93ec4

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

Which expression is equivalent to $(x^2 + 11)^2 + (x - 5)(x + 5)$?

A. $x^4 + 23x^2 - 14$

B. $x^4 + 23x^2 + 96$

C. $x^4 + 12x^2 + 121$

D. $x^4 + x^2 + 146$

Correct Answer: B

Rationale

Choice B is correct. The expression $(x^2 + 11)^2$ can be written as $(x^2 + 11)(x^2 + 11)$, which is equivalent to $x^2(x^2 + 11) + 11(x^2 + 11)$. Distributing x^2 and 11 to $(x^2 + 11)$ yields $x^4 + 11x^2 + 11x^2 + 121$, or $x^4 + 22x^2 + 121$. The expression $(x - 5)(x + 5)$ is equivalent to $(x - 5)x + (x - 5)5$. Distributing x and 5 to $(x - 5)$ yields $x^2 - 5x + 5x - 25$, or $x^2 - 25$. Therefore, the expression $(x^2 + 11)^2 + (x - 5)(x + 5)$ is equivalent to $(x^4 + 22x^2 + 121) + (x^2 - 25)$, or $x^4 + 22x^2 + 121 + x^2 - 25$. Combining like terms in this expression yields $x^4 + 23x^2 + 96$.

Choice A is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields -14, whereas substituting 0 for x in the given expression yields 96.

Choice C is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields 121, whereas substituting 0 for x in the given expression yields 96.

Choice D is incorrect. Equivalent expressions must be equivalent for any value of x. Substituting 0 for x in this expression yields 146, whereas substituting 0 for x in the given expression yields 96.

Question Difficulty: Medium

Question ID ce53810c

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

Which expression is equivalent to $\frac{h^{15}q^7}{h^5q^{21}}$, where $h > 0$ and $q > 0$?

A. $\frac{h^{10}}{q^{14}}$

B. $\frac{h^3}{q^3}$

C. $h^{10}q^{14}$

D. h^3q^3

ID: ce53810c Answer

Correct Answer: A

Rationale

Choice A is correct. For positive values of a, $\frac{a^m}{a^n} = a^{(m-n)}$, where m and n are integers. Since it's given that $h > 0$ and $q > 0$, this property can be applied to rewrite the given expression as $\left(h^{(15-5)}\right)\left(q^{(7-21)}\right)$, which is equivalent to $h^{10}q^{-14}$. For positive values of a, $a^{-n} = \frac{1}{a^n}$. This property can be applied to rewrite the expression $h^{10}q^{-14}$ as $\left(h^{10}\right)\left(\frac{1}{q^{14}}\right)$, which is equivalent to $\frac{h^{10}}{q^{14}}$.

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

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

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

Question Difficulty: Medium

Question ID f8a698f7

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

$$(5x^3 - 3) - (-4x^3 + 8)$$

The given expression is equivalent to $bx^3 - 11$, where b is a constant. What is the value of b?

Correct Answer: 9

Rationale

The correct answer is 9. The given expression can be rewritten as $(5x^3 - 3) + (-1)(-4x^3 + 8)$. By applying the distributive property, this expression can be rewritten as $5x^3 - 3 + 4x^3 + (-8)$, which is equivalent to $(5x^3 + 4x^3) + (-3 + (-8))$. Adding like terms in this expression yields $9x^3 - 11$. Since it's given that $(5x^3 - 3) - (-4x^3 + 8)$ is equivalent to $bx^3 - 11$, it follows that $9x^3 - 11$ is equivalent to $bx^3 - 11$. Therefore, the coefficients of x^3 in these two expressions must be equivalent, and the value of b must be 9.

Question Difficulty: Medium

Question ID 91f6f890

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

ID: 91f6f890

Which expression is equivalent to $\sqrt[7]{x^9 y^9}$, where x and y are positive?

A. msup

B. msup

C. msup

D. msup

ID: 91f6f890 Answer

Correct Answer: B

Rationale

Choice B is correct. For positive values of a and b, $a^m b^m = (ab)^m$, $\sqrt[n]{a} = (a)^{\frac{1}{n}}$, and $\left(a^j\right)^k = a^{jk}$. Therefore, the given expression, $\sqrt[7]{x^9 y^9}$, can be rewritten as $\sqrt[7]{(xy)^9}$. This expression is equivalent to $\left((xy)^9\right)^{\frac{1}{7}}$, which can be rewritten as $(xy)^{9 \cdot \frac{1}{7}}$, or $(xy)^{\frac{9}{7}}$.

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

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

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

Question Difficulty: Medium

Question ID aeef182c

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

$$f(x) = x^2 + bx$$
$$g(x) = 9x^2 - 27x$$

Functions f and g are given, and in function f, b is a constant. If $f(x) \cdot g(x) = 9x^4 - 26x^3 - 3x^2$, what is the value of b?

A. -26

B. $-\frac{26}{9}$

C. $\frac{1}{9}$

D. 9

Correct Answer: C

Rationale

Choice C is correct. Multiplying the given functions f and g yields $f(x) \cdot g(x) = (x^2 + bx)(9x^2 - 27x)$. Applying the distributive property to the right-hand side of this equation yields $f(x) \cdot g(x) = (x^2)(9x^2 - 27x) + (bx)(9x^2 - 27x)$. Applying the distributive property once again to the right-hand side of this equation yields $f(x) \cdot g(x) = (x^2)(9x^2) - (x^2)(27x) + (bx)(9x^2) - (bx)(27x)$, which is equivalent to $f(x) \cdot g(x) = 9x^4 - 27x^3 + 9bx^3 - 27bx^2$. Factoring out x^3 from the second and third terms yields $f(x) \cdot g(x) = 9x^4 + (-27 + 9b)x^3 - 27bx^2$. Since the left-hand sides of $f(x) \cdot g(x) = 9x^4 + (-27 + 9b)x^3 - 27bx^2$ and $f(x) \cdot g(x) = 9x^4 - 26x^3 - 3x^2$ are equal, it follows that $(-27 + 9b)x^3 = -26x^3$, or $-27 + 9b = -26$, and $-27bx^2 = -3x^2$, or $-27b = -3$. Adding 27 to each side of $-27 + 9b = -26$ yields $9b = 1$. Dividing each side of this equation by 9 yields $b = \frac{1}{9}$. Similarly, dividing each side of $-27b = -3$ by -27 yields $b = \frac{1}{9}$. Therefore, the value of b is $\frac{1}{9}$.

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

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

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

Question Difficulty: Medium

Question ID a65952d9

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

Which expression is equivalent to $\frac{8x(x-7)-3(x-7)}{2x-14}$, where $x > 7$?

A. $\frac{x-7}{5}$

B. $\frac{8x-3}{2}$

C. $\frac{8x^2-3x-14}{2x-14}$

D. $\frac{8x^2-3x-77}{2x-14}$

Correct Answer: B

Rationale

Choice B is correct. The given expression has a common factor of 2 in the denominator, so the expression can be rewritten as $\frac{8x(x-7)-3(x-7)}{2(x-7)}$. The three terms in this expression have a common factor of $(x-7)$. Since it's given that $x > 7$, x can't be equal to 7, which means $(x-7)$ can't be equal to 0. Therefore, each term in the expression, $\frac{8x(x-7)-3(x-7)}{2(x-7)}$, can be divided by $(x-7)$, which gives $\frac{8x-3}{2}$.

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

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

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

Question Difficulty: Medium