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Question: 1

Which is equivalent to $\sqrt{18} - 4\sqrt{8} + 2\sqrt{50}$?

- a. 0
- b. $5\sqrt{2}$
- c. $-5\sqrt{2}$
- d. $3\sqrt{2}$
- e. $-\sqrt{60}$

Answer:B

Explanation:

$$\sqrt{18} - 4\sqrt{8} + 2\sqrt{50} = \sqrt{9 \cdot 2} - 4\sqrt{4 \cdot 2} + 2\sqrt{25 \cdot 2} \text{ or } 3\sqrt{2} - 4 \cdot 2\sqrt{2} + 2 \cdot 5\sqrt{2} = 3\sqrt{2} - 8\sqrt{2} + 10\sqrt{2} \text{ or } 5\sqrt{2}$$

Question: 2

Given: $f(x) = 2x - 1$ and $g(x) = x^2 + 3$ What is the value of $g(f(-1))$?

- a. 3
- b. -6
- c. 12
- d. 4
- e. -4

Answer:C

Explanation:

To find the value of $g(f(-1))$, first find $f(-1)$, which equals $2(-1) - 1$ or -3.

Next, place -3 into the g function or find $g(-3)$: $g(-3) = (-3)^2 + 3$ or $9 + 3 = 12$.

Question: 3

Which are the zeroes for $x^3 - 3x + 2$?

- a. -2, -1, 1
- b. -1, 1, 2
- c. -2, 1
- d. -1, 2
- e. -2, -1

Answer:C

Explanation:

To find the zeroes of $x^3 - 3x + 2$, first use the rational root theorem that states that a rational root of the polynomial must be any factor of the last term, 2, divided by any rational factor of the first term's coefficient, 1. In this case, that would be $(\pm 2 \text{ or } \pm 1)/\pm 1$ or $(\pm 2 \text{ or } \pm 1)$. These are the only four possible rational roots of this polynomial. Each of these values is then substituted for x in the polynomial. The values that produce "zero" for the polynomial are "zeroes" of the polynomial.

$$f(1) = (1)^3 - 3(1) + 2 = 0$$

$$f(-1) = (-1)^3 - 3(-1) + 2 = 4$$

$$f(2) = (2)^3 - 3(2) + 2 = 4$$

$$f(-2) = (-2)^3 - 3(-2) + 2 = 0$$

1 and -2 are the only rational roots of this polynomial. Note: One of these must have a multiplicity of two - that is, a double zero. Why? Since the polynomial is a cubic, there are three zeroes, and, since imaginary zeroes must come in pairs, the third zero must be real.

Question: 4

Given: $\log a = 0.30$ and $\log b = 0.47$ Which of the following has a value of 0.77?

- a. $\log(a + b)$
- b. $(\log a)(\log b)$
- c. $\log ab$
- d. $b \log a$
- e. $a \log b$

Answer:C

Explanation:

Since $\log a = 0.30$ and $\log b = 0.47$, the problem is asking for the log of what number = 0.77 or the sum of $\log a$ and $\log b$. $\log a + \log b = \log(a \cdot b)$.

Question: 5

Which is the value of x in $8^{x+1} = 4^{2x-1}$?

- a. -5
- b. -1
- c. 1
- d. 3
- e. 5

Answer:E

Explanation:

To solve for x in $8^{x+1} = 4^{2x-1}$, first recognize 8 and 4 can both be written with a base 2 - that is, $8 = 2^3$ and $4 = 2^2$. Now, re-write using the base 2 notation:

$8^{x+1} = 4^{2x-1}$ or $(2^3)^{x+1} = (2^2)^{2x-1}$, which equals $2^{3x+3} = 2^{4x-2}$ since $(n^a)^b = n^{ab}$, where n is any base. In $2^{3x+3} = 2^{4x-2}$, since both have equal bases, their exponents must also be equal.

$$3x + 3 = 4x - 2 \text{ or } x = 5$$

Question: 6

The reduced form of $\frac{(1-i)(2+i)}{1+i}$ is

- a. $-2 - i$
- b. $1 - 2i$
- c. $-2 + 2i$
- d. $1 + i$
- e. $-2 + i$

Answer:B

Explanation:

In $\frac{(1-i)(2+i)}{1+i}$, first multiply the two factors in the numerator to get:

$\frac{2+i-2i-i^2}{1+i} = \frac{2-i-i^2}{1+i}$. Remember that $i^2 = -1$, or $\frac{2-i+1}{1+i} = \frac{3-i}{1+i}$. Then, multiply both numerator and denominator by the complex conjugate of the denominator. The complex conjugate of $1 + i$ is $1 - i$:
 $\frac{3-i}{1+i} \cdot \frac{1-i}{1-i}$ or $\frac{3-3i-i+i^2}{1-i^2}$. Further reduce to obtain $\frac{2-4i}{2}$.

Dividing numerator and denominator by 2 yields: $1 - 2i$.

Question: 7

The simplified form of $2x^{\frac{3}{2}} \cdot 3x^{-\frac{2}{3}}$ is

- a. $6x^{-2}$
- b. $6x^{-1}$
- c. $6x^{\frac{5}{3}}$
- d. $6x^{\frac{5}{6}}$
- e. $6x$

Answer: D

Explanation:

When multiplying expressions such as “x” with the same base, the rule is to ADD the exponents, but remember to MULTIPLY the coefficients.

$$2x^{\frac{3}{2}} \cdot 3x^{-\frac{2}{3}} = 6x^{(\frac{3}{2} + -\frac{2}{3})} \text{ or } 6x^{\frac{5}{6}}$$

Question: 8

What is the solution set for $|3x - 9| > 4$?

- a. $x > \frac{13}{3}$
- b. $x > -\frac{5}{3}$
- c. $x > \frac{13}{3}$ or $x < \frac{5}{3}$
- d. $x > \frac{13}{3}$ or $x < -\frac{13}{3}$
- e. $x > \frac{5}{3}$ or $x < -\frac{5}{3}$

Answer:C

Explanation:

$|3x - 9| > 4$ translates to $3x - 9 > 4$ or $3x - 9 < -4$ or

$$3x > 13 \text{ or } 3x < 5$$

$$x > \frac{13}{3} \text{ or } x < \frac{5}{3}$$



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