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38. Find the volume of a sphere whose radius is 3 cm. Leave your answer in terms of π .

- A. $36\pi \text{ cm}^3$
- B. $12\pi \text{ cm}^3$
- C. $18\pi \text{ cm}^3$
- D. $48\pi \text{ cm}^3$

Answer: A

Detailed Explanation:

Volume of sphere formula $= \frac{4}{3}\pi r^3$.

$$\begin{aligned}\text{Volume} &= \frac{4}{3} \times \pi \times 3^3 \\ &= \frac{4}{3} \times \pi \times 27 = 4 \times \pi \times 9 = \\ &= 36\pi \text{ cm}^3.\end{aligned}$$

39. Find the length of an arc of a circle of radius 14 cm which subtends an angle of 90° at the center. [Take $\pi = \frac{22}{7}$]

- A. 22 cm
- B. 44 cm
- C. 11 cm
- D. 88 cm

Answer: A

Detailed Explanation:

Arc length formula $= \frac{\theta}{360} \times 2\pi r$.

$$\begin{aligned}\text{Length} &= \frac{90}{360} \times 2 \times \frac{22}{7} \\ &\times 14 = \frac{1}{4} \times 2 \times 22 \times 2 = \\ &= \frac{1}{4} \times 88 = 22 \text{ cm}.\end{aligned}$$

Detailed Explanation:

Magnitude value formula $= \sqrt{x^2 + y^2}$.

$|\mathbf{a}| = \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$.

53. Factorize the expression completely: $4a^2 - 9b^2$.

A. $(2a - 3b)(2a + 3b)$

B. $(2a - 3b)^2$

C. $(4a - 9b)(a + b)$

D. $(2a + 3b)^2$

Answer: A

Detailed Explanation:

Recognize this expression as a difference of two squares format: $(2a)^2 - (3b)^2$.

Expanding using identity rules results in $(2a - 3b)(2a + 3b)$.

54. Find the values of x for which the matrix

$\begin{pmatrix} x & 4 \\ 2 & 2 \end{pmatrix}$ is singular.

A. 4

B. 2

C. 1

D. 8

Answer: A

Detailed Explanation:

A singular matrix has a determinant value equal to 0.

C. 3

D. 8

Answer: A

Detailed Explanation:

Find the derivative equation formula: $\frac{dy}{dx} = 2x - 3$.

Substitute the given coordinate $x = 4$: $\text{Gradient} = 2(4) - 3 = 8 - 3 = 5$.

64. Find the derivative of $f(x) = \frac{4}{x}$ with respect to x .

A. $-\frac{4}{x^2}$

B. $\frac{4}{x^2}$

C. $-4x$

D. $4\log x$

Answer: A

Detailed Explanation:

Rewrite function utilizing indices negative notation properties: $f(x) = 4x^{-1}$.

Differentiate: $-1 \times 4x^{-1-1} = -4x^{-2} = -\frac{4}{x^2}$.

65. Integrate the following expression: $\int (3x^2 + 4x) \, dx$. Do not omit constant component.

A. $x^3 + 2x^2 + c$

B. $3x^3 + 4x^2 + c$

C. $6x + 4 + c$

72. If the 3rd and 7th terms of an Arithmetic Progression are 11 and 23 respectively, find the common difference.

- A. 3
- B. 4
- C. 2
- D. 5

Answer: A

Detailed Explanation:

$$T_3 = a + 2d = 11 \text{ and } T_7 = a + 6d = 23$$

Subtract the first equation from the second: $(a + 6d) - (a + 2d) = 23 - 11$.

$$4d = 12 \implies d = 3$$

73. Convert 45_{10} to binary base structure number.

- A. 101101_2
- B. 110101_2
- C. 100101_2
- D. 111101_2

Answer: A

Detailed Explanation:

Divide by 2 repeatedly and track remainders from bottom to top:

$$45 / 2 = 22 \text{ rem } 1$$

$$22 / 2 = 11 \text{ rem } 0$$

$$11 / 2 = 5 \text{ rem } 1$$

$$5 / 2 = 2 \text{ rem } 1$$

$$2 / 2 = 1 \text{ rem } 0$$

$$6\left(\frac{p}{3}\right) + 6\left(\frac{p}{2}\right) = 6(5) \implies 2p + 3p = 30 \\ \implies 5p = 30 \implies p = 6.$$