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Basic operation questions for CDSE, CGL Tier 2, CGLTier 1 and SSC 10+2

Basic operation quiz 1

Direction: Study the following questions carefully and choose the right answer.

1. The quantity which must be added to $(1 - x)(1 + x^2)$ to obtain x^3 is:

A. $2x^3 + 3x^2 + x + 1$ B. $2x^3 + x^2 + x - 1$

C. $2x^3 - x^2 + x - 1$ D. $-x^2 + x - 1$

2. If the expression $x^3 + 3x^2 + 4x + k$ has a factor $x + 5$, then what is the value of k?

A. -70 B. 70

C. 48 D. -48

3. What is $\dfrac{(x^2 + y^2)(x - y) - (x - y)^3}{x^2 y - xy^2}$ equal to?

A. 1   B. 2

C. 4   D. -2

4. Consider the following statements

I. $x + 3$ is the factor of $x^3 + 2x^2 + 3x + 8$.

II. $x - 2$ is the factor of $x^3 + 2x^2 + 3x + 8$.

Which of the statements given above is/are correct?

A. Only I   B. Only II

C. Both I and II   D. Neither I nor II

5. If $\left(x^2 + \dfrac{1}{x^2}\right) = \dfrac{17}{4}$, then what is $\left(x^3 - \dfrac{1}{x^3}\right)$ equal to?

A. 75/16

B. 63/8

C. 95/8

D. None of these

6. The expression $2x^3 + x^2 - 2x - 1$ is divisible by

A. x + 2

B. 2x + 1

C. x − 2

D. 2x − 1

7. For what value of k is (x − 5) a factor of $x^3 - 3x^2 + kx - 10$?

A. −8

B. 4

C. 2

D. 1

8. $x^3 + 6x^2 + 11x + 6$ is divisible by

A. Only (x + 1)

B. Only (x + 2)

C. Only (x + 3)

D. All of these

9. $(x^4 + 5x^3 + 6x^2)$ is equal to:

A. $x(x + 3)(x^2 + 2)$

B. $x^2(x + 3)(x + 2)$

C. $x^2(x - 2)(x - 3)$

D. $x(x^2 + 3)(x + 2)$

10. If $3x^4 - 2x^3 + 3x^2 - 2x + 3$ is divided by (3x + 2), then the remainder is

A. 0

B. 185/27

C. 181/25

D. 3/4

1	2	3	4	5	6	7	8	9	10
C	B	B	D	B	B	A	D	B	B

Explanations:

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

So, $2x^3 - x^2 + x - 1$ is added to $1 + x^2 - x - x^3$ to obtain x^3.

Hence, option C is correct.

2). Here, x + 5 is a factor.

So, $x + 5 = 0 \Rightarrow x = -5$

Now, $x^3 + 3x^2 + 4x + k = (-5)^3 + 3 \times (-5)^2 + 4 \times (-5) + k$

$\Rightarrow -125 + 75 - 20 + k = 0$

Now, $-70 + k = 0$

So, k = 70.

Hence, option B is correct.

3).
$$\frac{(x^2 + y^2)(x - y) - (x - y)^3}{x^2 y - xy^2}$$

$$= \frac{(x^3 + xy^2 - x^2 y - y^3 - (x^3 - y^3 - 3x^2 y + 3xy^2)}{x^2 y - xy^2}$$

$$= \frac{(x^3 + xy^2 - x^2 y - y^3 - x^3 + y^3 + 3x^2 y - 3xy^2)}{x^2 y - xy^2}$$

$$= \frac{2x^2y - 2xy^2}{x^2y - xy^2} = \frac{2(x^2y - 2xy^2)}{x^2y - xy^2} = 2$$

Hence, option B is correct.

4).   Put x = –3 in equation $x^3 + 2x^2 + 3x + 8$

$$= (-3)^3 + 2(-3)^2 + 3(-3) + 8$$

$$= -10 \neq 0$$

So, (x + 3) is not the factor of $x^3 + 2x^2 + 3x + 8$

Similarly, put x = 2 in above equation

$$= (2)^3 + 2(2)^2 + 3(2) + 8$$

$$= 30 \neq 0$$

So, (x – 2) is also not the factor of $x^3 + 2x^2 + 3x + 8$.

Hence, option D is correct.

5).

$$\left(x^2 + \frac{1}{x^2}\right) = \frac{17}{4}$$

$$\Rightarrow x^2 + \frac{1}{x^2} + 2 - 2 = \frac{17}{4} \Rightarrow \left(x - \frac{1}{x}\right)^2 + 2 = \frac{17}{4}$$

$$\Rightarrow \left(x - \frac{1}{x}\right)^2 = \frac{17}{4} - 2 \Rightarrow \left(x - \frac{1}{x}\right)^2 = \frac{9}{4}$$

$$\Rightarrow \left(x - \frac{1}{x}\right) = \frac{3}{2}$$

On cubing both side, we get

$$\Rightarrow \left(x - \frac{1}{x}\right)^3 = \left(\frac{3}{2}\right)^3$$

$$\Rightarrow x^3 - \frac{1}{x^3} - 3 \times \frac{1}{x} \cdot x \left(x - \frac{1}{x}\right) = \frac{27}{8}$$

$$\Rightarrow x^3 - \frac{1}{x^3} = \frac{27}{8} + 3 \times \left(\frac{3}{2}\right)$$

$$\Rightarrow x^3 - \frac{1}{x^3} = \frac{27}{8} + \frac{9}{2}$$

$$\Rightarrow \left(x^3 - \frac{1}{x^3}\right) = \frac{63}{8}$$

Hence, option B is correct.

6). Let $f(x) = 2x^3 + x^2 - 2x - 1$

$= x^2(2x + 1) - 1(2x + 1)$

$= (x^2 - 1)(2x + 1) = (2x + 1)(x + 1)(x - 1)$

Hence, option B is correct.

7). Let $f(x) = x^3 - 3x^2 + kx - 10$

Now, $f(x)$ at $(x = 5)$

$$\Rightarrow f(x) = (5)^3 - 3(5)^2 + 5k - 10 = 0$$

$$\Rightarrow 125 - 3 \times 25 + 5k - 10 = 0$$

$$\Rightarrow 125 - 75 - 10 + 5k = 0$$

$\Rightarrow$ $40 + 5k = 0$ $\Rightarrow$ $5k = -40$ $\Rightarrow$ $k = -8$.

Hence, option A is correct.

8). Let $f(x) = x^3 + 6x^2 + 11x + 6$

$f(x) = 0$. So, put $x = -1, -2$ and -3

$f(-1) = (-1)^3 + 6(-1)^2 + 11(-1) + 6 = -1 + 6 - 11 + 6$

$= -12 + 12 = 0$.

$f(-2) = (-2)^3 + 6(-2)^2 + 11(-2) + 6 = -8 + 24 - 22 + 6$

$= -30 + 30 = 0$.

$f(-3) = (-3)^3 + 6(-3)^2 + 11(-3) + 6 = -27 + 54 - 33 + 6$

$= -60 + 60 = 0$.

Hence, $(x + 1)$, $(x + 2)$ and $(x + 3)$ are the factors of f(x).

Hence, option D is correct.

9). $(x^4 + 5x^3 + 6x^2) = x^2(x^2 + 5x + 6)$

$= x^2(x^2 + 3x + 2x + 6) = x^2(x + 3)(x + 2)$.

Hence, option B is correct.

10). **$f(x) = 3x^4 - 2x^3 + 3x^2 - 2x + 3$**

$(3x + 2) = 0$ $\Rightarrow$ $x = \dfrac{-2}{3}$

Remainder $= f(\dfrac{-2}{3}) = 3(\dfrac{-2}{3})^4 - 2(\dfrac{-2}{3})^3 + 3(\dfrac{-2}{3})^2 - 2(\dfrac{-2}{3}) + 3$

$$= 3 \times \frac{16}{81} - 2 \times \frac{-8}{27} + 3 \times \frac{4}{9} + \frac{4}{3} + 3$$

$$= \frac{16}{27} + \frac{16}{27} + \frac{4}{3} + \frac{4}{3} + 3 = \frac{32}{27} + \frac{8}{3} + 3$$

$$= \frac{32 + 72 + 81}{27} = \frac{185}{27}$$

Hence, option B is correct.