Test (6)

Mr. D

1. $3^x + 3^x + 3^x =$

(a) 9^x

(b) 3^{x+1}

(c) 9^{3x}

(d) 3^{3x}

① $3^x + 3^x + 3^x = 3(3^x)$

$= 3 \times 3^x = 3^{1+x}$

$= \boxed{3^{x+1}} \rightarrow$ (b)

Remember

$a + a + a = 3a$

2. If $P(x) = x^3 - x^2 - x + 1$ and $Q(x) = x^2 - 2x + 1$, then $\frac{Q(x)}{P(x)} =$

(a) $\frac{1}{x+1}$

(b) $\frac{1}{x^2+1}$

(c) $\frac{1}{x-1}$

(d) $\frac{1}{x^2-1}$

② $P(x) = (x^3 - x^2) + (-x + 1)$

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

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

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

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

So $\frac{Q(x)}{P(x)} = \frac{(x-1)(x-1)}{(x-1)(x+1)(x-1)} = \boxed{\frac{1}{x+1}}$

(a)

3. **The solution set for** $3x^2 - 7x + \frac{49}{12} = 0$ **contains:**

(a) Two Solution

(b) One Solution

(c) No Solutions

(d) None of the above

(3) $b^2 - 4ac = (-7)^2 - 4(3) \times \frac{49}{12}$

$= 49 - \cancel{12} \times \frac{49}{\cancel{12}}$

$= 49 - 49 = 0$

so, two equal solutions ⟶ 1 solution

(b)

4. **The solution set for the inequality** $2 - \frac{1}{x} < 1$ **is:**

(a) $(1, \infty)$

(b) $(0,1)$

(c) $(1,2)$

(d) $(-\infty, 1)$

④ $2 - \frac{1}{x} < 1$

$2 - \frac{1}{x} - 1 < 0$

$1 - \frac{1}{x} < 0$

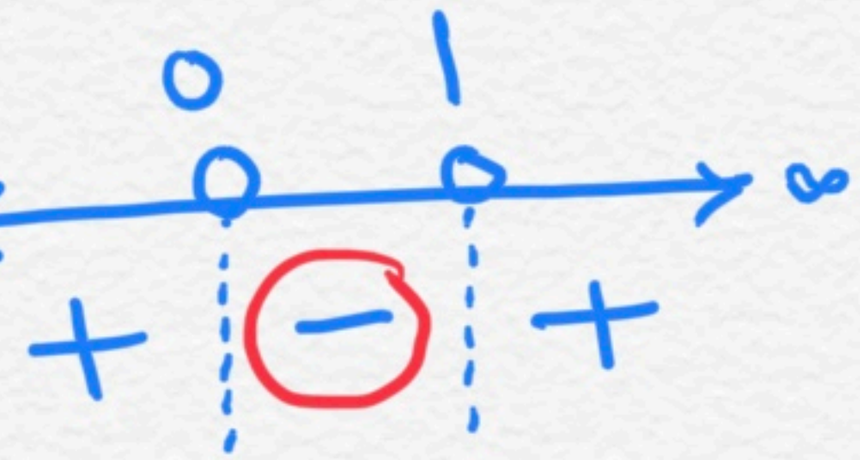
$\frac{1x}{1x} - \frac{1}{x} < 0$

$\frac{x-1}{x} < 0$

1 ← $x-1$

0 ← x

Rational inequality



(0, 1)

b

5. **The solution set for $\frac{|x|}{x} + 2 = x$ contains:**

(a) Infinite number of solutions

(b) Two solutions

(c) One solution

(d) None of the above

⑤ $\frac{|x|}{x} + 2 = x$

If $x \geq 0$

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

$1 + 2 = x$

$x = 3$

$x = 3$

If $x < 0$

$\frac{-x}{x} + 2 = x$

$-1 + 2 = x$

$x = 1$

Rejected

So, one solution ©

6. **The domain of** $f(x) = \dfrac{\sqrt{x}-7}{\sqrt{x}+8}$ **is:**

(a) $(-8, 7)$

(b) $\Re \setminus \{-8\}$

(c) $(49, 64)$

(d) $[0, \infty)$

⑥ $x \geq 0 \longrightarrow [0, \infty)$

but, let's see what give us zero in the denominator to avoid it.

$\sqrt{x} + 8 = 0$

$\sqrt{x} = -8$ (impossible)

Domain = $[0, \infty)$ → (d)

7. $\frac{x^2+y^2}{x+y} =$

(a) $x+y$

(b) $x-y$

(c) $\frac{x+y}{2}$

(d) None of the above

7. $\frac{x^2+y^2}{x+y}$ ← can't be factorized

→ d

8. **Let A and B be two cylinders where half of A's base diameter is quarter of B's base diameter. While the height of A is double the height of B. Which of the following statements is true?**

(a) Volume A is equal to volume B

(b) Volume A is half of volume B

(c) Volume A is quarter of volume B

(d) Volume A is double volume B

(8) $\frac{1}{2} D_a = \frac{1}{4} D_b \rightarrow D_a = \frac{2}{1} \times \frac{1}{4} D_b$ (2)

$D_a = \frac{1}{2} D_b$

so, the diameter of A $= \frac{1}{2}$ the diameter of B

which means: Radius of A $= \frac{1}{2}$ Radius of B

A: $r = x$, $H = 2h$ $\rightarrow V_A = \pi r^2 H = \pi x^2 (2h) = 2x^2 \pi h$

B: $r = 2x$, $H = h$ $\rightarrow V_B = \pi r^2 H = \pi (2x)^2 h = 4x^2 \pi h$

It's obvious that $V_A = \frac{1}{2} V_B$

(b)

9. **81 kg of flour consists of oats and wheat flour. The ratio of wheat to oat flour is 7 to 2. How much oats should be added for the oats to be one third of the wheat flour?**

(a) $6\,kg$

(b) $9\,kg$

(c) $3\,kg$

(d) None of the above

⑨ wheat : oat : Total (flour)

7 : 2 : 9

: : 81

$$\text{wheat} = \frac{7 \times 81^{9}}{\cancel{9}} = 7 \times 9 = 63\,kg$$

$$\text{oat} = \frac{2 \times \cancel{81}^{9}}{\cancel{9}} = 2 \times 9 = 18\,kg$$

$\frac{1}{3}$ of the wheat $= \frac{1}{3} \times 63 = 21\,kg$

so, we need to add 3kg to the 18kg to make it 21 kg. ⟶ (C)

10. **In a sale, prices were reduced by 20%. If the price of an item is 80 KD before the sale, then its price during the sale is:**

(a) $60\ KD$

(b) $64\ KD$

(c) $58\ KD$

(d) $66\ KD$

(10) before discount : discount : After discount

% 100 : 20 : 80

KD 80 : : x

$$x = \frac{80 \times 80}{100} = 8 \times 8 = 64$$

b

11. **A farmer has a certain amount of apples. If he sells 40% of the apples, 42 kg remain. What was the initial amount of apples?**

(a) 70 kg

(b) 60 kg

(c) 58 kg

(d) 64 kg

(11)

%	Before selling	:	selling	:	After selling
	100	:	40	:	60
Kg	x	:		:	42

$$x = \frac{100 \times 42}{60} = \frac{10 \times 42^{7}}{6} = 70$$

a

12. $\sqrt{x^2 - y^2} =$

(a) $|x - y|$

(b) $|x| - |y|$

(c) $|x + y|$

(d) None of the above

(12) $\sqrt{x^2-y^2}$ → Can't be simplified

Remember $\sqrt{x \pm y} \neq \sqrt{x} \pm \sqrt{y}$ → (d)

13. **20 loaves of bread were given to a group of 20 people consists of men, women and children. Each man, woman and child has been given three, two and half a loaf of bread respectively. How many children are in the group?**

(a) 5

(b) 9

(c) 13

(d) 10

(13) the no. of children must be even, as the total (20) is a whole no.

the only even option is 10 → d

14. In a university, exams are conducted in two classrooms. If we send 10 students from classroom A to classroom B, then the number of students in both classrooms will be equal. However, if we send 20 students from classroom B to classroom A, the number of students in classroom A will be double the number of students in classroom B. How many students are in classroom A?

(a) 80
(b) 100
(c) 60
(d) None of the above

(A) → x

(y) → y

$x - 10 = y + 10$

$\boxed{x = y + 20}$ —— ①

$x + 20 = 2(y - 20)$

$x + 20 = 2y - 40$

$\boxed{x = 2y - 60}$ —— ②

from eqn. ① & ②:

$y + 20 = 2y - 60$

$20 + 60 = 2y - y$

$y = 80$

Ineqn. ① $x = 80 + 20$

$x = 100$

→ (b)

15. If $x - y = 3$ and $x^2 + y^2 = 29$, then $xy =$

(a) 10

(b) 18

(c) 28

(d) None of the above

(15) $x - y = 3$

$(x - y)^2 = (3)^2$

$x^2 - 2xy + y^2 = 9$

$x^2 + y^2 - 2xy = 9$

$29 - 2xy = 9$

$29 - 9 = 2xy$

$20 = 2xy$

$xy = 10$

(a)

16. **The minimum value of $P(x) = x^2 - 6x + 9$ is:**

(a) -6

(b) 9

(c) *zero*

(d) None of the above

(16) To find the min. $\longrightarrow P'(x) = 0$

$2x - 6 = 0$

$2x = 6 \longrightarrow x = 3$

$P(3) = (3)^2 - 6(3) + 9 = 9 - 18 + 9$

$= 0$

the min. point is $(3, 0)$

the min. value is $0 \rightarrow C$

Remember

Min. or Max. means the y-value not x.

17. $\frac{a}{b}-\left(\frac{b}{a}-\frac{C}{a}\right)=$

(a) $\frac{a^2-b^2-bc}{ab}$

(b) $\frac{a^2+b^2-bc}{ab}$

(c) $\frac{a^2-b^2+bc}{ab}$

(d) None of the above

(17) $\frac{a}{b}-\left(\frac{b-c}{a}\right)$

$= \frac{a \times a}{b \times a} - \frac{(b-c) \times b}{a \times b}$

$= \frac{a^2 - b(b-c)}{ab}$

$= \frac{a^2 - b^2 + bc}{ab}$ ⟶ (C)

18. $\dfrac{1-3^{-2}}{3^{-1}+3^{-2}} =$

(a) 2

(b) -2

(c) $\frac{15}{4}$

(d) $\frac{-15}{4}$

(18) $\dfrac{1-\frac{1}{3^2}}{\frac{1}{3}+\frac{1}{3^2}} = \left(1-\frac{1}{9}\right) \div \left(\frac{1\times3}{3\times3}+\frac{1}{9}\right)$

$= \left(\frac{8}{9}\right) \div \left(\frac{3}{9}+\frac{1}{9}\right)$

$= \frac{8}{9} \div \frac{4}{9} = \frac{8}{\cancel{9}} \times \frac{\cancel{9}}{4} = \frac{8}{4}$

$= 2 \longrightarrow$ (a)

19. If $f(x)=\frac{1}{2}(x+7)$, then $f(2x-7)=$

(a) 14

(b) x

(c) *zero*

(d) None of the above

(19) $f(2x-7)=\frac{1}{2}(2x-7+7)$

$=\frac{1}{2}(2x)=x$

→ (b)

20. Let $f(x) = (x^C)\left(x^{\frac{1}{C}}\right)$ where C is a nonzero constant.

If $f(2) = 4\sqrt{2}$, then $C =$

(a) 3

(b) 2

(c) 4

(d) 16

(20) $f(2) = 4 \times \sqrt{2}$

$= 2^2 \times 2^{\frac{1}{2}}$

$f(2) = 2^C \times 2^{\frac{1}{C}}$

$C = 2 \rightarrow b$