1. Simplify: $\dfrac{(a^{-2}b)^{-4}(ab)^{-3}}{a^{-4}}$

Test (1)

Mr. D

(a) $\dfrac{a^5}{b^7}$

(b) $\dfrac{a9}{b^{-7}}$

(c) $\dfrac{a^{-5}}{b^{-7}}$

(d) $\dfrac{a^9}{b^7}$

1 $\dfrac{(a^{-2}b)^{-4}(ab)^{-3}}{a^{-4}}$

$= \dfrac{a^8 b^{-4} \times a^{-3} b^{-3}}{a^{-4}}$

$= \dfrac{a^5 \times b^{-7}}{a^{-4}}$

$= a^9 b^{-7}$

$= \dfrac{a^9}{b^7} \rightarrow$ d

2. The solution set of $|2x+1| = 1$ is:

(a) $\{0\}$
(b) $\{-1\}$
(c) $\{1, -1\}$
(d) None of the previous

② $|2x+1| = 1$

$2x+1 = \pm 1$

or

$2x+1 = 1$

$2x = 0$

$\boxed{x = 0}$

$2x+1 = -1$

$2x = -2$

$\boxed{x = -1}$

$\{0, -1\} \longrightarrow$ d

3. Find the domain of $f(x) = \begin{cases} \sqrt{x-5} & \text{if } x > 3 \\ \dfrac{1}{x+5} & \text{if } x < 0 \end{cases}$

(a) $\Re \setminus \{-5\}$

(b) $(-\infty, -5) \cup (-5, 0) \cup [5, \infty)$

(c) $(-\infty, 0) \cup (3, \infty)$

(d) $[5, \infty)$

③ when $x > 3$:

$x - 5 \geq 0$

$x \geq 5$

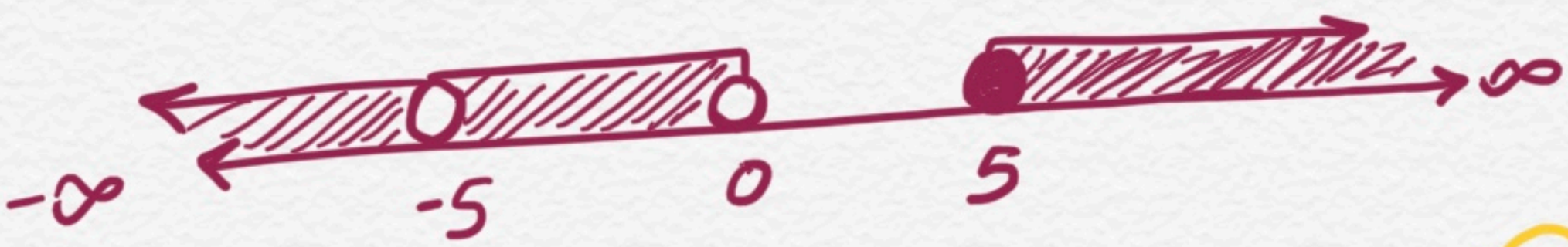
$[5, \infty)$

when $x < 0$:

$x + 5 \neq 0$

$x \neq -5$

$(-\infty, 0) / \{-5\}$



$(-\infty, -5) \cup (-5, 0) \cup [5, \infty) \rightarrow$ b

4. $\left(\frac{9}{4}\right)^{\frac{-5}{2}}\left(\frac{2}{3}\right)^{-3} =$

(a) $\left(\frac{2}{3}\right)^{2}$

(b) $\frac{9}{4}$

(c) $\left(\frac{3}{4}\right)^{2}$

(d) $\frac{3}{2}$

④ $\left(\frac{9}{4}\right)^{-5/2} \times \left(\frac{2}{3}\right)^{-3}$

$= \left(\left(\frac{3}{2}\right)^{2}\right)^{-\frac{5}{2}} \times \left(\frac{2}{3}\right)^{-3}$

$\cancel{2} \times \frac{-5}{\cancel{2}} = -5$

$= \left(\frac{3}{2}\right)^{-5} \times \left(\frac{2}{3}\right)^{-3}$

$= \left(\frac{2}{3}\right)^{5} \times \left(\frac{2}{3}\right)^{-3}$

$= \left(\frac{2}{3}\right)^{2} \longrightarrow$ a

5. If $x^3 < 0$, then $\sqrt{25x^2} + 5x =$

(a) $5x^{\sqrt{2}} + 5x$
(b) $10x$
(c) 0
(d) None of the previous

(5) If $x^3 < 0$

$\sqrt[3]{x^3} < \sqrt[3]{0}$

$x < 0$

$\sqrt{25x^2} + 5x$

$= \sqrt{25}\sqrt{x^2} + 5x$

$= 5|x| + 5x$

$= 5(-x) + 5x$

$= -5x + 5x = 0$

$\longrightarrow$ C

Remember

* $\sqrt{x^2} = |x|$
* $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

6. If $f(x) = \dfrac{x^2}{2x^2+5x+3}$, then $f(x+1) =$

(a) $\dfrac{x^2+2x+1}{2x^2+9x+10}$

(b) $\dfrac{x^2+1}{2x^2+5x+4}$

(c) $\dfrac{x^2+1}{2x^2+9x+5}$

(d) $\dfrac{x^2+2x+1}{2x^2+6x+10}$

6 $f(x+1) = \dfrac{(x+1)^2}{2(x+1)^2+5(x+1)+3}$

$= \dfrac{x^2+2x+1}{2(x^2+2x+1)+5x+5+3}$

$= \dfrac{x^2+2x+1}{2x^2+4x+2+5x+5+3}$

$= \dfrac{x^2+2x+1}{2x^2+9x+10} \rightarrow$ a

7. The solution set of $|5 - 3x| < 7$ is:

(a) $\left(-\infty, \frac{-2}{3}\right) \cup (4, \infty)$

(b) $\left(-\infty, \frac{-2}{3}\right)$

(c) $(-1, 4)$

(d) $\left(\frac{-2}{3}, 4\right)$

7 $|5-3x|<7$

$-7<5-3x<7$

$-7-5<-3x<7-5$

$-12<-3x<2$

$\frac{-12}{-3}>x>\frac{2}{-3}$

$4>x>-\frac{2}{3}$

Remember

$|x|\leq a$

$-a\leq x\leq a$

the solution: $\left(\frac{-2}{3}, 4\right) \longrightarrow$ d

8. If $y = \dfrac{x}{x+1}$ then

(a) $x = \dfrac{y}{1-y}$

(b) $x = \dfrac{y}{y-1}$

(c) $x = \dfrac{y+1}{y}$

(d) $x = \dfrac{1-y}{y}$

8

$$y = \frac{x}{x+1}$$

$\times$

$$y(x+1) = x$$

$$xy + y = x$$

$$xy - x = -y$$

$$x(y-1) = -y$$

$$x = \frac{-y}{(y-1)} \quad \begin{matrix} \times(-1) \\ \times(-1) \end{matrix}$$

$$x = \frac{y}{-y+1} \rightarrow x = \frac{y}{1-y} \rightarrow a$$

making x the subject

9. $\dfrac{2}{x-1} - \dfrac{1}{x+2} =$

(a) $\dfrac{x-5}{x^2+x-2}$

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

(c) $\dfrac{x+5}{x^2+x-2}$

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

9

$$\frac{2}{(x-1)}\frac{(x+2)}{(x+2)} - \frac{1}{(x+2)}\frac{(x-1)}{(x-1)}$$

Common denominator

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

$$= \frac{2x+4-x+1}{x^2+2x-1x-2}$$

$$= \frac{x+5}{x^2+x-2} \longrightarrow \text{C}$$

10. $(a+2b)^2 - 3(a+2b) - 10 =$

(a) $(a+2b-2)(a+2b+5)$

(b) $(a+2b+2)(a+2b+5)$

(c) $(a+2b+2)(a+2b-5)$

(d) None of the previous

(10) let $y = (a+2b)$

$y^2 - 3y - 10$

$= (y + 2)(y - 5)$

$= (a+2b+2)(a+2b-5) \rightarrow$ (c)

11. $x^2 - z^2 - 6xy + 9y^2 =$

(a) $(x - 3y + z)(x - 3y - z)$
(b) $(x + 3y + z)(x - 3y - z)$
(c) $(x + 3y - z)(x - 3y - z)$
(d) None of the previous

(11) $x^2 - z^2 - 6xy + 9y^2$

Rearrange

$= x^2 - 6xy + 9y^2 - z^2$

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

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

Difference of two squares

$= \left((x-3y) + z\right)\left((x-3y) - z\right)$

$= (x-3y+z)(x-3y-z) \rightarrow$ a

12. 25 rabbits in a farm consume 90 kg of food every two days. How many kg of food would 10 rabbits consume in a week?

(a) 119 kg
(b) 112 kg
(c) 140 kg
(d) 126 kg

(12) For 25 rabbits

90 kg : 2 days

? kg : 7 days

$$\frac{90 \times 7}{2} = 45 \times 7$$

$$= 315 \text{ kg}$$

$$\begin{array}{r} 45 \\ \times 7 \\ \hline 315 \end{array}$$

In 1 week

25 rab. : 315 kg

10 rab. : x

$$x = \frac{\cancel{10}^{2} \times 315}{\cancel{25}_{5}}$$

$$x = \frac{630}{5}$$

$$x = 126 \text{ kg}$$

→ d

13. The solution set of $x^3 + 10x = 7x^2$ is:

(a) $\{2, 5\}$
(b) $\{0, 2, 3\}$
(c) $\{2, 5, 3\}$
(d) None of the previous

13 $x^3 + 10x = 7x^2$

$x^3 - 7x^2 + 10x = 0$

$x(x^2 - 7x + 10) = 0$

$x(x-5)(x-2) = 0 \rightarrow \{0, 2, 5\}$

$x = 0$ or $x - 5 = 0$, $x = 5$ or $x - 2 = 0$, $x = 2$ $\rightarrow$ d

14. Prices in a sale were reduced by 35%. What was the price of a washing machine before the sale if its sale price is 92.950 KD?

(a) 135 KD
(b) 153 KD
(c) 145 KD
(d) 143 KD

(14) before disc. : disc. : After dis.

%	100	35	65
KD	x		92.950

$$x = \frac{100 \times 92.95}{65} = \frac{9295}{65}$$

$$= 143$$

$$\begin{array}{r} 143 \\ 65 \overline{)9295} \\ -65 \\ \hline 279 \\ 260 \\ \hline 195 \end{array}$$

→ d

15. When water freezes into ice, its volume is increased by 6%. What is the volume of water obtained when 768.5 cc of ice melts?

(a) 725 cc
(b) 735 cc
(c) 745 cc
(d) 722.39 cc

(15) before inc. : inc. : After inc.

% : 100 : 6 : 106

cc : x : : 768.5

$$x = \frac{100 \times 768.5}{106} = \frac{76850}{106}$$

$$\begin{array}{r} 725 \\ 106 \overline{)76850} \\ 742 \\ \hline 265 \\ 212 \\ \hline 530 \\ 530 \\ \hline 000 \end{array}$$

$= 725 \rightarrow$ a

16. The side of a cube A is 2cm longer than the side of a cube B. If the surface area of A is 54 cm^2, find the volume of B.

(a) 1 cm^3
(b) 8 cm^3
(c) 125 cm^3
(d) None of the previous

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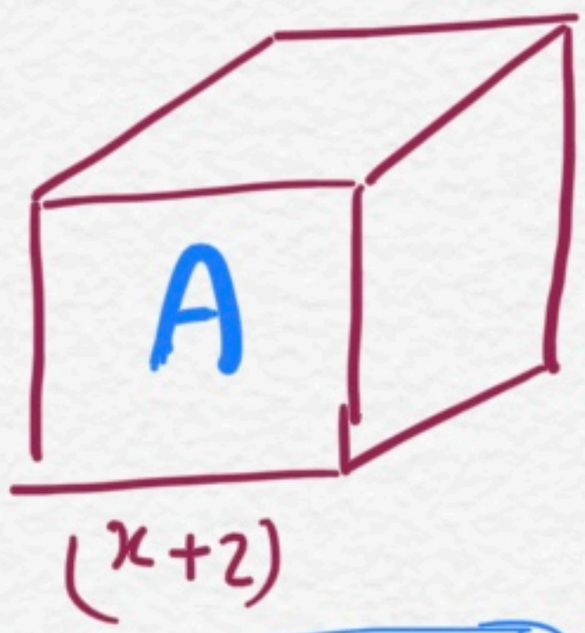

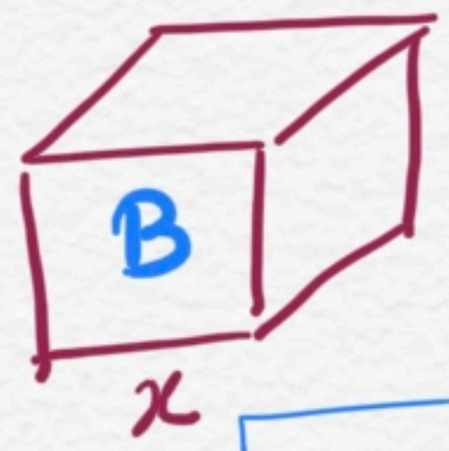

$$\boxed{S.A. = 6\ell^2}$$

$$54 = 6 \times (x+2)^2$$

$$\div$$

$$9 = (x+2)^2$$

$$\pm\sqrt{9} = x+2$$

$$\pm 3 = x+2$$

side can't be negative

$$3-1 = x$$

$$\boxed{x = 1}$$

$$\boxed{V. = \ell^3}$$

$$V = (1)^3$$

$$V = 1$$

$\longrightarrow$ a

17. The water in a hotel tank can last for 8 days if the hotel is full with guests. How long does the water last if only 40% of the hotel is occupied?

(a) 5 days
(b) 25 days
(c) 20 days
(d) 40 days

(17) Occupation : days of water

% 100 : 8

40 : x

Inverse variation

$$x = \frac{8 \times 100}{40} = \frac{80}{4} = 20$$

→ C

18. Let $f(x) = 1 - \dfrac{1}{x+1}$ and $g(x) = \dfrac{1}{f(x)}$. Find the composite function $f \circ g(x)$.

(a) $\dfrac{x+1}{2x+1}$

(b) $\dfrac{2x+1}{x+1}$

(c) 1

(d) x

(18) $f \circ g(x) = fg(x)$

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

$$g(x) = \frac{1}{\frac{x}{x+1}} = \frac{x+1}{x}$$

$$f \circ g(x) = \frac{\frac{x+1}{x}}{\frac{x+1}{x} + 1}$$

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

$$= \frac{x+1}{x} \div \frac{2x+1}{x}$$

$$= \frac{x+1}{x} \times \frac{x}{2x+1}$$

$$= \frac{x+1}{2x+1}$$

$\longrightarrow$ a

19. A shopkeeper bought 50 kg of apples for 250 fils per kilo. He then discovered that 10 kg of them are damaged and cannot be sold. What is the selling price of the rest of the apples if the shopkeeper wants a total profit of 2.5 KD?

(a) 340 fils/kg
(b) 395 fils/kg
(c) 375 fils/kg
(d) 350 fils/kg

(19) Cost $= 50 \times 250 = 12500$ fils

KD2.5

Aiming income $= 12500 + 2500$

$= 15000$ fils

$40 \times \boxed{x} = 15000$

$x = \frac{15000}{40} = \frac{1500}{4} = \frac{750}{2}$

$= 375$ fils $\rightarrow$ C

20. x workers can finish a job in y days. How many workers are needed to finish the job in $3y$ days?

(a) $3x$

(b) $3y$

(c) $\frac{x}{3}$

(d) $\frac{y}{3}$

20

x workers : y days

$\boxed{?}$: $3y$ days

$$\boxed{?} = \frac{x \times \cancel{y}}{3\cancel{y}} = \frac{x}{3}$$

Inverse variation

→ C

Direct variation :

x : A

B : C

$$x = \frac{A \times B}{C}$$

Inverse variation

y : A

B : C

$$y = \frac{B \times C}{A}$$