

## Part I

1. Find the equation of the straight line passing through the points  $(2, -5)$  and  $(5, 4)$ .

(a)  $y = -3x + 1$

(b)  $y = 3x - 11$

(c)  $y = \frac{1}{3}x - \frac{17}{3}$

(d)  $y = -\frac{1}{3}x - \frac{13}{3}$

Solution: **b)**

2. Perform the operation and simplify.  $\frac{x^2 - 5x + 78}{18x + x^2 - 208} - \frac{x}{x + 26}$

(a)  $\frac{8}{x + 26}$

(b)  $\frac{-2x}{x - 26}$

(c)  $\frac{x}{x - 8}$

(d)  $\frac{3}{x - 8}$

Solution: **d)**

3. Solve the system of linear equations shown below.

$$\frac{1}{2}x - \frac{2}{3}y = 25$$

$$\frac{1}{3}x + \frac{1}{6}y = 2$$

(a)  $(18, -24)$

(b)  $(-18, -51)$

(c)  $(24, -36)$

(d)  $(-6, -42)$

Solution: **a).**

4. Simplify  $\frac{2ax + 6ay - bx - 3by}{6ax - 2ay - 3bx + by}$

(a)  $\frac{x + 3y}{3x - y}$

(b)  $\frac{x - 3y}{3x + y}$

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

(d)  $\frac{x-y}{x+y}$

Solution: **a**).

5. Find the equation of the straight line that passes through the point  $(3, 3)$  and is perpendicular to the line  $2x + y = 7$ .

(a)  $y = -2x + 9$

(b)  $y = \frac{1}{2}x + \frac{13}{2}$

(c)  $y = -2x - \frac{7}{2}$

(d)  $y = \frac{1}{2}x + \frac{3}{2}$

Solution: **d**).

6. Simplify  $1 - \frac{1}{1 - \frac{1}{x-3}}$ .

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

(b)  $\frac{2x-7}{x-4}$

(c)  $-\frac{1}{x-4}$

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

Solution: **c**).

7. The solution set of the equation  $x^3 = 24x^2 + 217x$

(a)  $\{-7, 0, 7\}$

(b)  $\{-31, 31\}$

(c)  $\{-7, 0, 31\}$

(d) there is no solution, the solution set is  $\emptyset$ .Solution: **c**).

8. Perform the operation and simplify.  $\frac{(2p)^3 - 27}{x^2 - 49} \div \frac{6p + 4p^2 + 9}{14p - 3x + 2px - 21}$

(a)  $\frac{1}{x+7}$

(b)  $\frac{(2p-3)^2}{x-7}$

(c)  $2p - 3$

(d)  $x - 7$

Solution: b)

## Part II

1. Simplify each of the following expressions.

(a) 
$$\frac{5 - \frac{1}{a}}{\frac{1}{a^2} - 25} = -\frac{a}{5a + 1}$$

(b) 
$$\frac{30ax^2 - 2ax - 4a}{4b - 22bx + 30bx^2} = \frac{a(3x + 1)}{b(3x - 1)}$$

2. Completely factor each of the following.

(a)  $ax^4 - 9ay^2 + 18by^2 - 2bx^4 = (a - 2b)(x^2 + 3y)(x^2 - 3y)$

(b)  $5p^4t^2 - 5q^4t^2 = 5t^2(p^2 + q^2)(p + q)(p - q)$

(c)  $3a^3m - a^3n + 3b^3m - b^3n = (a + b)(a^2 - ab + b^2)(3m - n)$

(d)  $15a^2cd - 33abcd + 6b^2cd = 3cd(a - 2b)(5a - b)$

3. Solve each of the following equations. Make sure to check your solution.

(a)  $35x^3 - 65x^2 = 10x \quad 2, 0, -\frac{1}{7}$

(b)  $\frac{3 - x}{4} - \frac{10 - 3x}{5} = x + 2 \quad -5$

(c)  $|3x + 1| - 7 = 1 \quad -3, \frac{7}{3}$

(d)  $|3x + 1| - 1 = -11 \quad \text{no solution.}$

(e)  $(x + 4)(1 - 2x) = 3x - 2(x - 3)^2 \quad 1$

(f)  $3(x - 5) - 5(x - 1) = -2x + 1 \quad \text{no solution}$

(g)  $\left| \frac{1}{2}x - 3 \right| - 2 = -23 \quad \text{no solution}$

(h)  $\left| \frac{1}{2}x - 3 \right| - 2 = 23 \quad -44, 56$

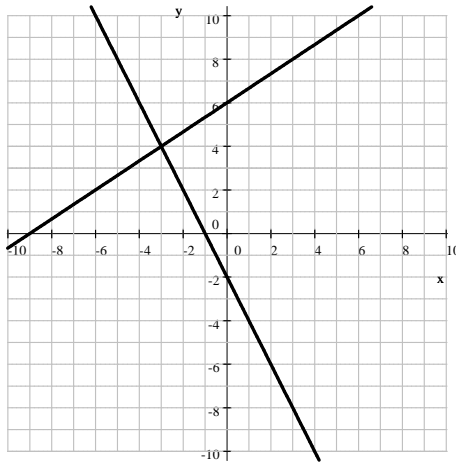
4. Solve each of the following inequalities.

(a)  $-3 < -\frac{1}{2}x + 7 \leq 5 \quad [4, 20).$

(b)  $-7 > -2x - 11 \geq -31$   $(-2, 10]$ .

5. Graph the straight lines  $2x - 3y = -18$  and  $2x + y = -2$  in the same coordinate system.

(a) Use your graph to find the coordinates of the point where the lines intersect.  $(-3, 4)$



(b) Use algebraic methods to check your solution.

$$2(-3) - 3(4) = -6 - 12 = -18 \implies \text{the point } (-3, 4) \text{ is on the first line}$$

$$2(-3) + (4) = -6 + 4 = -2 \implies \text{the point } (-3, 4) \text{ is on the second line}$$

6. Solve the system of linear equations. Make sure to check your solution.  $(-2, 5)$ .