

Jimma university
College of Natural science
Department of Mathematics
Mathematics for Remedial students' Work Sheet I
May /2023 G.C
Chapter One: - Solving Equations and Inequalities

1. Solve each of the following problems.

a). $8(2 + 3x) + 1 = x - 10(x + 1)$ b). $2x(6x - 1) + 21 = 8x - x(3 - 12x)$

c). $\frac{8-4x}{3x-2} = 2 - \frac{10x}{3x-2}$ d). $\frac{4w-1}{w-2} + \frac{8w}{w^2-6w+8} = \frac{4w+3}{w-4}$

e). $\frac{6}{x^2-3x} = \frac{12}{x} + \frac{1}{x-3}$ f). $\frac{4}{x-3} - \frac{3}{x-2} = \frac{1}{x-4}$

2. Solve each of the following inequalities and give the solution in both inequality and interval notations.

a). $4(x + 2) - 1 > 5 - 7(4 - x)$ b). $\frac{4x+3}{2x-5} > 0$

c). $\frac{1}{2}(3 + 4x) \leq 6\left(\frac{1}{3} - \frac{x}{2}\right) - \frac{1}{4}(2 + 10x)$ d). $-\frac{x+5}{2} \leq \frac{12+3x}{4}$

e). $4(x^2 + 1) + 8(3x - 4) > 4x^2$

3. Solve the quadratic equations.

a). $x^2 + 2x - 63 = 0$ b). $7 - 5x^2 + 2x = 0$

c). $(3x - 2) - (x - 3)^2 + 11 = 0$ d). $\frac{x+3}{x-3} + \frac{x-6}{x+6} = \frac{11}{5}$

e). $\frac{5}{x-1} + \frac{5}{x-1} = \frac{6}{x-2}$

4. Solve the quadratic inequalities.

a). $4x - x^2 > 12$ b). $x^2 + 6 > -2x$ c). $-x^2 - 4x - 3 \geq 0$

d). $-(x^2 - 1) + 2(1 - x) - 5 \leq 0$ e). $\frac{x^2+4x+4}{2x^2-x-1} > 0$

f). $\frac{4}{1+x} + \frac{2}{1-x} < 1$ g). $\frac{1-2x-3x^2}{3x-x^2-5} > 0$

5. Solve the following system of equation for x & y .

a). $\begin{cases} \frac{3x}{2} - \frac{5y}{3} = -2 \\ \frac{x}{3} + \frac{y}{2} = \frac{13}{6} \end{cases}$ b). $\begin{cases} 11x + 15y + 23 = 0 \\ 0.7x - 2y - 20 = 0 \end{cases}$ c). $\begin{cases} 0.4x - 1.5y = 6.5 \\ 0.3x - 0.2y = 0.9 \end{cases}$

$$\begin{array}{lll} \text{d). } \begin{cases} \frac{4}{x} + 3y = 8 \\ \frac{6}{x} - 4y = -5 \end{cases} & \text{e). } \begin{cases} \frac{2}{x} + \frac{3}{y} = 13 \\ \frac{5}{x} - \frac{4}{y} = -2 \end{cases} & \text{f). } \begin{cases} \frac{1}{2x} - \frac{1}{y} = -1 \\ \frac{1}{x} + \frac{1}{2y} = 8 \end{cases} \quad (x \neq 0, y \neq 0) \\ \\ \text{g). } \begin{cases} x^2 - 2y^2 = 8 \\ x + 2y = 8 \end{cases} & \text{h). } \begin{cases} 6x + 3y = 7xy \\ 3x + 9y = 11xy \end{cases} & \text{i). } \begin{cases} \frac{5}{x-1} + \frac{1}{y-2} = 2 \\ \frac{6}{x-1} + \frac{3}{y-2} = 1 \end{cases} \end{array}$$

6. Solve the following equations.

a). $|3x + 4| = |x + 5|$ b). $|x + 3| + |x + 5| = 10$ c). $|x + 5| = x + 15$

d). $5|x - 1|^2 + 9|x - 1| - 2 = 0$ e). $x^2 - 5|x| + 6 = 0$

f). $\begin{cases} x + 2y = 8 \\ |x + 2| + y = 6 \end{cases}$ g). $|x^2 - 7x + 6| = 6 - x$

7. For what value (s) of k is $kx^2 + 6x + 1 > 0$ for each real number x ?

8. For what value(s) of k does each of the following quadratic equations have

i) One real root? ii). Tow distinct real roots? Iii). No real root?

a). $(k + 2)x^2 - (k + 2)x - 1 = 0$

b). $x^2 + (5 - k)x + 9 = 0$

9. The area of a rectangle is 21 cm^2 . If one side exceeds the other side by 4 cm . Find the dimension of the rectangle.

10. The sum of the square of two consecutive natural numbers is 313. Find the numbers.

11. Birr 6500 were divided equally among a certain number of persons. Had there been 15 more persons, each would have got Birr 30 less. Find the original number of persons.

12. The difference in price in colored pencils and mechanical pencils is \$0.20. If I purchased 18 colored pencils and 22 mechanical pencils for \$27.60, what is the cost of the mechanical pencils?

13. A library contains 2000 books. There are 3 times as many non-fiction books as fiction books. Write and solve a system of equations to determine the number of nonfiction and fiction books.

14. Simplify the following rational expression to lowest terms.

$$\begin{array}{lll} \text{a). } \frac{\frac{1}{x^2-1}}{\frac{1}{1-\frac{1}{x}}-1} & \text{b). } \frac{\left(\frac{x-y}{x+y}+1\right) \cdot \left(\frac{x}{y}-\frac{y}{x}\right)}{\left(\frac{x-y}{x+y}-1\right) \cdot \left(\frac{1}{x^2}-\frac{1}{y^2}\right)} & \text{c). } \frac{\frac{6\sqrt{20}-3\sqrt{45}}{3\sqrt{75}}}{\frac{1}{\sqrt{90}}} \end{array}$$

Chapter Two:- Relations and Functions

- Find the inverse of $\mathbb{R}$ for the relation defined by $\mathbb{R} = \{(x, y) : y \geq x^2 \text{ and } y \leq 5\}$.
- Find the domain and range of the following functions.
 - $f(x) = 1 + 8x - 2x^2$
 - $f(x) = \frac{1}{x^2 - 5x + 6}$
 - $f(x) = \sqrt{x^2 - 6x + 8}$
 - $f(x) = \begin{cases} 3x + 4, & -1 \leq x < 2 \\ 1 + x, & 2 \leq x \leq 5 \end{cases}$
- Let R be a relation on the set $A = \{1, 2, 3, 4, 5, 6, 7\}$ defined by $R = \{(a, b) : 4 \text{ divides } a - b\}$.
 - List the elements of R
 - Find $\text{Dom}(R)$ & $\text{Range}(R)$
 - Find the elements of R^{-1}
 - Find $\text{Dom}(R^{-1})$ & $\text{Range}(R^{-1})$
- Given $f(x) = 5x^2 - 3x + 2$ and $gof(x) = 20x^2 - 12x + 11$, then what is the value of $g(-1)$?
- Let $f(x) = \frac{1}{x+2}$ and $g(x) = \frac{1}{x+3}$. Find
 - $fog(x)$
 - Domain of $fog(x)$
 - Inverse of $fog(x)$
 - Range of $fog(x)$
- If $f(x) = x^2 + px + 1$ where $f(0)$ and $f(1)$ have opposite signs so that f has a root in $(0, 1)$. What the possible value of p ?
- Write the general polynomial $p(x)$ whose only zeros are 1, 2 and 3, with multiplicity 3, 2 and 1 respectively. What is its degree?
- Find $p(x)$ described in question number 9 above if $p(0) = 6$.
- What is the vertical horizontal asymptote of the graph of the function
 - $f(x) = 5 + \frac{|x|}{x+1}$?
 - $f(x) = \frac{2x^2 - 3x - 2}{x^2 + x - 6}$
- Solve the value of x of the following equations
 - $\frac{10}{1+e^{-x}} = 2$
 - $4^x = 5^{x+1}$
 - $2^{x+5} = 2^{x+3} + 12$
 - $5^{2x} - 5^x - 12 = 0$
 - $4^{x+1} + 2^x - 5 = 0$
 - $(\log_3 x)^2 + (\log_x 3)^2 = 13$
 - $\log_2(x - 2) + \log_2 x = 3$
 - $\log_{81}[\log_3(26 + x)] = \frac{\log_{25} 5}{2}$
 - $\log_{\frac{x}{4}} x + \log_{4x} x = -1$
 - $\log_2(\log_2(\log_2 x)) = 1$

k). $(3 - 2\sqrt{2})^{\frac{x}{4}} + (3 + 2\sqrt{2})^{\frac{x}{4}} = 34$

11. Find the inverse of $f(x) = e^{(3x-1)}$

12. Let $\log_{17} x = \frac{8}{9}$ then find $\log_x 289$.

13. If $\log 2 = x, \log 3 = y$ & $\log 5 = z$, find $\log(120)^{\frac{1}{2}}$.

14. Let $f(x) = 2^x$. Show that $f(x+3) = 8f(x)$.

15. Let $g(x) = 5^x$. Show that $g(x-2) = \frac{1}{25}g(x)$.

16. Let $f(x) = e^{\sqrt{x}}$. Find a function so that $(f \circ g)(x) = (g \circ f)(x) = x$.

17. What is the domain of the given greatest integer function $f(x) = 1/[x]$?

18. Find the greatest integer value of the following.

a). $[13.01]$

b). $[13.99]$

c). $[-2.4]$

19. If $f(x) = [2x + 1]$, what is the value of $f(-3.2)$?

20. If $g(x) = [-27x^2 + 1]$, what is the value of $f\left(\frac{-1}{3}\right)$?

21. Find the value of x such that $[x + 1] = 3$.

22. Convert the given angle from radians to degrees

a) $\frac{\pi}{3}$

b) $-\frac{5\pi}{2}$

c) $-\frac{4\pi}{3}$

23. Convert the given angle from degrees to radians

a) 315°

b) -40°

c) 330°

24. Given $\tan \theta = \frac{1}{2}$ and $\sin \theta < 0$, find $\cos \theta$.

25. Let $\frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5}$, then find $\tan^2 x$.