

Directions: Show all necessary steps leading to the answers in the space provided. For each question, a correct answer is only worth 1 point.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 1) Solve and graph. Write the result in interval notation.
 $6x \leq 60$

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$$\frac{\cancel{6}x}{\cancel{6}} \leq \frac{\cancel{60}}{\cancel{6}}$$

$$x \leq 10$$

in interval notation

$$(-\infty, 10]$$



- 2) Solve the system by the addition method.
 $4x + 9y = -15$
 $-5x - 4y = 26$

$$4x + 9y = -15 \dots\dots\dots i$$

$$-5x - 4y = 26 \dots\dots\dots ii$$

multiply equation (i) by 5 and equation (ii) by 4

$$20x + 45y = -75 \dots\dots\dots iii$$

$$-20x - 16y = 104 \dots\dots\dots iv$$

Add equation (iii) and (iv)

$$0x + 29y = 29 \dots\dots\dots v$$

Divide equation (v) by 29

$$\frac{\cancel{29}y}{\cancel{29}} = \frac{\cancel{29}}{\cancel{29}}$$

$$y = 1$$

Substitute the value of y to equation (i) to get the value of x

$$4x + 9(1) = -15$$

$$4x = -15 - 9$$

$$4x = -24 \dots\dots\dots vi$$

Divide equation (vi) by 4

$$\frac{\cancel{4}x}{\cancel{4}} = -\frac{\cancel{24}}{\cancel{4}}$$

$$x = -6$$

3) Divide the rational expressions.

$$\frac{10y^8}{x^{10}} \div \frac{40y^2}{3x}$$

$$\frac{10y^8}{x^{10}} \div \frac{40y^2}{3x}$$

Multiply $\frac{10y^8}{x^{10}}$ by the inverse of $\frac{40y^2}{3x}$

$$\frac{\cancel{10}y^{\cancel{8}}}{\cancel{x^{10}}} \times \frac{\cancel{3}x}{\cancel{40}y^2}$$

$$= \frac{y^6}{x^9} \times \frac{3}{4}$$

$$= \frac{3y^6}{4x^9}$$

- 4) Multiply the radical expressions and simplify your answer.

$$4\sqrt{6x^6y^3} \times \sqrt{10xy^6}$$

$$4\sqrt{6x^6y^3} \times \sqrt{10xy^6}$$

$$= 4\sqrt{6x^6y^3 \times 10xy^6}$$

$$= 4\sqrt{60x^7y^9}$$

$$= 4\sqrt{4 \times 15 \times x^7 \times y^9}$$

$$= 4 \times 2 \times \sqrt{15 \times x^6 \times x \times y^8 \times y}$$

$$= 8\sqrt{15 \times (x^3)^2 \times x \times (y^4)^2 \times y}$$

$$= 8x^3y^4\sqrt{15xy}$$

Perform the indicated operations. Simplify the result, if possible. Show all your work.

$$5) \quad \frac{7x}{x+1} + \frac{8}{x-1} - \frac{14}{x^2-1}$$

$$\frac{7x}{x+1} + \frac{8}{x-1} - \frac{14}{x^2-1}$$

The factors of $x^2 - 1$ is $x + 1$ and $x - 1$,

since it is a difference of two square

therefore the least common denominator is $x^2 - 1$

$$\begin{aligned} & \frac{7x(x-1)+8(x+1)-14}{x^2-1} \\ &= \frac{\cancel{7x}(\cancel{x-1}) + 8(\cancel{x+1}) - 14}{(\cancel{x-1})(\cancel{x+1})} \\ &= 7x - 14 \end{aligned}$$

SHORT ANSWER. Find the least common denominator of the rational expressions.

$$6) \quad \frac{1}{35x}, \frac{1}{5x^2} \text{ and } \frac{1}{7x^3}$$

$$\frac{1}{35x}, \frac{1}{5x^2} \text{ and } \frac{1}{7x^3}$$

To find the least common denominator,

Step 1 : find the prime factors of the denominator

$$35x = x, 5, 7,$$

$$5x^2 = x, x, 5$$

$$7x^3 = x, x, x, 7$$

Step 2 : Write down the factors that each number shares

x

Step 3 : Write down any left over factors to the multiplication sentence

$$x, x, 5, 7$$

Step 4 : Multiply step 2 and step 3 to get the least common denominator

$$x \times x \times x \times 5 \times 7 = \underline{\underline{35x^3}}$$

7) Solve the equation

$$5x^2 = 35$$

$$5x^2 = 35$$

$$\frac{\cancel{x^2}}{\cancel{x^2}} = \frac{\cancel{35}}{\cancel{5}}$$

$$x^2 = 7$$

$$\sqrt{x^2} = \sqrt{7}$$

$$x = \sqrt{7}$$

- 8) Simplify the rational expression. List any restrictions.

$$\frac{y^2 + 7y - 30}{y^2 - 9}$$

$$\frac{y^2+7y-30}{y^2-9}$$

step 1 : factorise the numerator

the two numbers that multiply together to make -30 , and add up to 7 are -3 and 10 . Therefore substituting the two values to $7y$ we get;

$$y^2 - 3y + 10y - 30$$

put the above expression in groups to get

$$(y^2 - 3y) + (10y - 30)$$

$$y(y - 3) + 10(y - 3)$$

So the factors are,

$$(y + 10)(y - 3)$$

step 2 : factorise the denominator

the denominator is a difference of two squares.

therefore, its factors are;

$$(y + 3)(y - 3)$$

step 3 : Rewrite the expression and simplify

$$= \frac{(y+10)(y-3)}{(y+3)(y-3)}$$

$$= \frac{(y+10) \cancel{(y-3)}}{(y+3) \cancel{(y-3)}}$$

$$= \frac{y+10}{y+3}$$

- 9) Write an equation of the line satisfying the given conditions. Write the answer in slope-intercept form. The line passes through (2, 10) and (3, 12).

$$\begin{aligned}\text{slope} &= \frac{\Delta y}{\Delta x} \\ &= \frac{y_1 - y_2}{x_1 - x_2} \\ \frac{12 - 10}{3 - 2} &= \frac{2}{1} = 2\end{aligned}$$

$$y = mx + c$$

where $m = \text{slope}$ and $c = y - \text{intercept}$

$$y = 2x + c$$

using the point (2, 10)

$$10 = 2(2) + c$$

$$10 - 4 = c$$

$$c = 6$$

$$\underline{\mathbf{y = 2x + 6}}$$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 10) Which one of the following methods cannot be used to solve the equation $x^2 - 4x - 6 = 0$?

A) Completing the square

B) Factoring

C) Quadratic formula

D) All of the methods can be used.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 11) Express in terms of i .

$$\sqrt{-192}$$

$$\begin{aligned}
& \sqrt{-192} \\
&= \sqrt{-1 \times 192} \\
&= \sqrt{-1} \times \sqrt{192} \\
&= \sqrt{-1} \times \sqrt{64 \times 3} \\
&= \sqrt{-1} \times 8\sqrt{3} \\
&\sqrt{-1} = i \\
&\text{therefore,} \\
&\sqrt{-192} = 8i\sqrt{3}
\end{aligned}$$

Find the slope of the line containing the two given points.

- 12) (-4, 10) and (13, -14)

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\frac{-14 - 10}{13 - (-4)} = \frac{-24}{17}$$

$$y = mx + c$$

using the point (-4, 10)

$$10 = \frac{-24}{17}(-4) + c$$

$$10 - \frac{96}{17} = c$$

$$c = \frac{74}{17}$$

therefore the equation is;

$$y = -\frac{24}{17}x + \frac{74}{17}$$

- 13) Express the compound inequality using interval notation, and graph the solution set.

$$x < -4 \text{ or } x > 7$$

$$x < -4 \text{ or } x > 7$$

$$-4 > x > 7$$

$$(-\infty, -4) \cup (7, \infty)$$



- 14) Solve using the quadratic formula. Show all your work.

$$3m^2 + 8m + 1 = 0$$

$$3m^2 + 8m + 1 = 0$$

$$\text{Quadratic formula} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 3, b = 8, c = 1$$

$$m = \frac{-8 \pm \sqrt{8^2 - (4 \times 3 \times 1)}}{2 \times 3}$$

$$= \frac{-8 \pm \sqrt{64 - 12}}{6}$$

$$= \frac{-8 \pm \sqrt{52}}{6} = \frac{-8 \pm 2\sqrt{13}}{6}$$

$$= \frac{-4 \pm \sqrt{13}}{3}$$

$$\text{therefore, } m = \frac{-4 - \sqrt{13}}{3}, m = \frac{-4 + \sqrt{13}}{3}$$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 15) Solve and graph.

$$5x - 5 \geq -15 \text{ and } 5x - 5 \leq 5$$

$$5x - 5 \geq -15 \dots\dots\dots \textbf{i}$$

$$5x \geq -15 + 5$$

$$\frac{\cancel{5}x}{\cancel{5}} \geq \frac{-\cancel{10}}{\cancel{5}}$$

$$x \geq -2$$

$$5x - 5 \leq 5 \dots\dots\dots \textbf{ii}$$

$$5x \leq 5 + 5$$

$$\frac{\cancel{5}x}{\cancel{5}} \leq \frac{\cancel{10}}{\cancel{5}}$$

$$x \leq 2$$

Solution : $-2 \leq x \leq 2$

Interval Notation : $[-2, 2]$



16) Add the radical expressions.

$$7\sqrt{2} + \sqrt{98}$$

$$7\sqrt{2} + \sqrt{98}$$

$$= 7\sqrt{2} + \sqrt{7 \times 7 \times 2}$$

$$= 7\sqrt{2} + \sqrt{7^2 \times 2}$$

$$= 7\sqrt{2} + 7\sqrt{2}$$

$$7\sqrt{2} + \sqrt{98} = 14\sqrt{2}$$

17) Simplify the expression. Assume that all variables represent positive real numbers.

$$\sqrt[3]{64a^6b^9}$$

$$\begin{aligned}\sqrt[3]{64a^6b^9} &= \sqrt[3]{64} \times \sqrt[3]{a^6} \times \sqrt[3]{b^9} \\ &= 4 \times \sqrt[3]{a^6} \times \sqrt[3]{b^9} \\ \sqrt[3]{a^6} &= \sqrt[3]{a^2 \times a^2 \times a^2} = \sqrt[3]{(a^2)^3} = a^2 \\ \sqrt[3]{b^9} &= \sqrt[3]{b^3 \times b^3 \times b^3} = \sqrt[3]{(b^3)^3} = b^3\end{aligned}$$

therefore;

$$\sqrt[3]{64a^6b^9} = 4a^2b^3$$

18) Solve the equation.

$$\begin{aligned}-3 + \sqrt{3x+5} &= 3 \\ -3 + \sqrt{3x+5} &= 3 \\ \sqrt{3x+5} &= 3 + 3 \\ \sqrt{3x+5} &= 6 \\ (\sqrt{3x+5})^2 &= 6^2 \\ 3x+5 &= 36 \\ 3x &= 36 - 5 = 31 \\ \cancel{x} &= \frac{31}{\cancel{3}} \\ x &= \frac{31}{3}\end{aligned}$$

19) Write an equation of the line satisfying the given conditions. Write the answer in slope-intercept form. The line passes through the point (2, 15) and has a slope of 5.

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = 5$$

$$y = mx + c$$

using the point (2, 15)

$$15 = 5(2) + c$$

$$15 - 10 = c$$

$$c = 5$$

therefore the equation is;

$$y = 5x + 5$$

20) Determine the slope and the y-intercept.

$$6x - 9y = -27$$

$$6x - 9y = -27$$

$$\cancel{6x} - 9y + \cancel{6x} = -27 + 6x$$

$$-\cancel{9}y = -\cancel{27} + \cancel{6}x$$

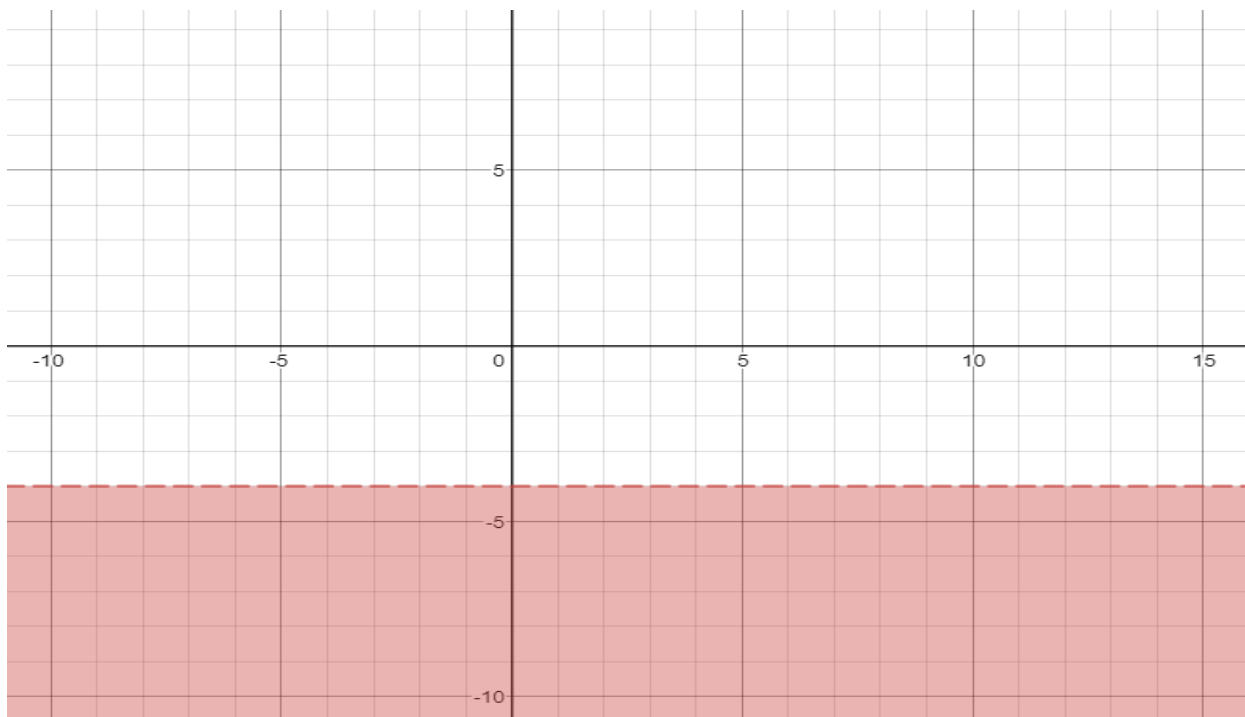
$$(-y = -3 + \frac{2x}{3}) \times -1$$

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

from the equation $y = mx + c$ where $m = \text{slope}$

$$m = -\frac{2}{3} = \text{slope}$$

21) Graph: $y < -4$



- 22) Simplify using the division property of radicals. Assume that all variables represent positive real numbers.

$$\sqrt{\frac{32b^6}{2b^{16}}}$$

$$\sqrt{\frac{32b^6}{2b^{16}}} = \sqrt{\frac{16}{b^{10}}}$$

$$\sqrt{16} = 4$$

$$\sqrt{b^{10}} = \sqrt{b^2 \times b^8} = \sqrt{(b^5)^2} = b^5$$

therefore;

$$\sqrt{\frac{32b^6}{2b^{16}}} = \frac{4}{b^5}$$

- 23) Solve the equation. Show all your work.

$$z^2 + 16z + 42 = 0$$

$$z^2 + 16z + 42 = 0$$

Using Completing Square Method

$$z^2 + 16z = -42$$

$$z^2 + 16z + \left(\frac{16}{2}\right)^2 = -42 + \left(\frac{16}{2}\right)^2$$

$$(z + 8)^2 = 22$$

$$\sqrt{(z + 8)^2} = \sqrt{22}$$

$$z + 8 = \sqrt{22}$$

$$z = -8 - \sqrt{22} \text{ or } z = -8 + \sqrt{22}$$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

24) Solve the system by using the substitution method.

$$y = 150x - 150$$

$$y = -200x + 900$$

$$y = 150x - 150 \dots\dots\dots i$$

$$y = -200x + 900 \dots\dots\dots ii$$

Substitute the values of y in equation ii with those of equation i

$$150x - 150 = -200x + 900$$

put like terms together

$$150x + 200x = 900 + 150$$

$$\frac{\cancel{350}x}{\cancel{350}} = \frac{\cancel{1050}}{\cancel{350}}$$

$$x = 3$$

Now use equation i to substitute the values of x to get y

$$y = 150(3) - 150$$

$$y = 300$$

25) Convert the expression to radical form and simplify

$$(-64)^{\frac{1}{3}}$$

$$\begin{aligned}
 (-64)^{\frac{1}{3}} &= \sqrt[3]{-64} = \sqrt[3]{-4^3} \\
 &= -4
 \end{aligned}$$