

P3/P4 Linear Equations & Inequalities Lines in the Plane

- Obj:
1. Solve linear eq / ineq.
 2. Find Slope
 3. Slope-int form / point-slope form
 4. Graph linear eq.
 5. Find \parallel & \perp lines

Aug 24-9:38 AM

Prove $x = -2$ is a solution for
the eq: $x^3 - x + 6 = 0$

$$(-2)^3 - (-2) + 6 = 0$$

$$(-2)(-2)(-2)$$

$$-8 + 2 + 6 = 0$$

$$0 = 0 \quad \checkmark$$

Aug 24-9:40 AM

Solve for x : $\left(\frac{x}{2} + \frac{1}{6} = \frac{x}{3}\right) \cdot 6$
 $\frac{x}{2}(6) + \frac{1}{6}(6) = \frac{x}{3}(6)$
 Clear the fraction! LCD: 6

$\frac{x}{2}(6)$
 $*3x + 1 = 2x$
 $-3x$ $-3x$

$1 = -x$ $*-1 = x$
 $*x = -1$

Aug 24-9:43 AM

Linear Equations:
 anything that can be written in
 the form: $ax + b = 0$
 a, b : real #s $a \neq 0$

$2z - 4 = 0$ Yes Linear
 $3u^2 - 12 = 0$ No, not linear
 $x + 6 + \frac{1}{x} = 0$ Not Linear
 $x + 2x + \sqrt{x} = 0$ Not linear

Aug 24-9:47 AM

Solve: $2(2x-3) + 3(x+1) = 5x+2$

$4x-6 + 3x+3 = 5x+2$

$7x-3 = 5x+2$

$-5x+3 \quad -5x+3$

$\frac{2x}{2} = \frac{5}{2}$

$x = \frac{5}{2}$

$3(5z-3) - 4(2z+1) = 5z-2$

$15z-9-8z-4$

$7z-13 = 5z-2$

$-5z+13 \quad -5z+13$

$\frac{2z}{2} = \frac{11}{2}$

$z = \frac{11}{2}$

!!

Aug 24-9:50 AM

Solve: $\left(\frac{t-1}{3} + \frac{t+5}{4} = \frac{1}{2} \right) 12$

LCD: 12

$12 \left(\frac{t-1}{3} \right) + 12 \left(\frac{t+5}{4} \right) = \frac{1}{2}(12)$

$4(t-1) + 3(t+5) = 6$

$4t-4 + 3t+15 = 6$

$7t+11 = 6$

$-11 \quad -11$

$\frac{7t}{7} = \frac{-5}{7}$

$t = -\frac{5}{7}$

Aug 24-9:57 AM

Linear inequalities :

$$ax + b > 0$$

$$<$$

$$\geq$$

$$\leq$$

Solve: $3(x-1) + 2 \leq 5x + 6$

$$3x - 3 + 2 \leq 5x + 6$$

$$3x - 1 \leq 5x + 6$$

$$-5x + 1 \quad -5x + 1$$

$$-2x \leq 7$$

$$x \geq -\frac{7}{2}$$



Aug 24-10:00 AM

$$3(-3) < \left(\frac{2x+5}{3} \right) \leq (5)3$$

$$-9 < 2x + 5 \leq 15$$

$$\frac{-14}{2} < \frac{2x}{2} \leq \frac{10}{2}$$

$$-7 < x \leq 5$$

Aug 24-10:08 AM

Slope: $m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x}$

$(x_1, y_1) (x_2, y_2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$$

Find the slope:

a. $(-1, 2) (4, -2)$
 $m = \frac{-2 - 2}{4 - (-1)} = \frac{-4}{5}$

b. $(1, 1) (3, 4)$
 $m = \frac{4 - 1}{3 - 1} = \frac{3}{2}$

Find the value of x if given

$(x, 3) (5, 9) m = 2$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$5 - x(2) = \frac{9 - 3}{5 - x} 5 - x$$

$$\begin{array}{r} 10 - 2x = 6 \\ -10 \quad -10 \\ \hline -2x = -4 \\ \frac{-2x}{-2} = \frac{-4}{-2} \\ x = 2 \end{array}$$

Aug 24-10:10 AM

Point-Slope Form :

$(x_1, y_1) m$

$$y - y_1 = m(x - x_1)$$

Find the eq. of the line through $(-3, -4)$ with slope 2.

x_1, y_1

$$y + 4 = 2(x + 3)$$

$$\begin{array}{r} y + 4 = 2x + 6 \\ -4 \quad -4 \\ \hline \end{array}$$

Slope $\rightarrow y = 2x + 2$
 Intercept

Aug 24-10:18 AM

Slope Intercept

$$y = mx + b$$

Find the eq. of the line w/ slope 3
through $(-1, 6)$

Slope-int

$$y = mx + b$$

$$y = 3x + b$$

$$6 = 3(-1) + b$$

$$6 = -3 + b$$

$$+3 +3$$

$$b = 9$$

$$y = 3x + 9$$

Point-Slope

$$y - b = m(x - a)$$

$$y - 6 = 3(x + 1)$$

$$y - 6 = 3x + 3$$

$$+6 \quad +6$$

$$y = 3x + 9$$

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Find eq: through $(1, 2)$ $m = \frac{1}{2}$

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

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

$$+2 \quad +2$$

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

Aug 24-10:24 AM

Forms of Equations:

Slope-Intercept: $y = mx + b$

Point-Slope: $y - y_1 = m(x - x_1)$

General: $Ax + By + C = 0$
 $A, B, C \neq \text{fractions}$

Vertical Line: $x = k$

Horizontal Line: $y = k$

Aug 24-10:26 AM

Parallel Lines:

never intersect
 same slopes

Perpendicular Lines:

intersect @ 90° angles

Slopes are opposite reciprocals

$m: 2$ $\perp m: -\frac{1}{2}$

$m: -\frac{4}{3}$ $\perp m: \frac{3}{4}$

Aug 24-10:28 AM

Find an eq. of the line through $(1, 2)$
and parallel to $y = 3x - 2$.
perpendicular
same

$$m: 3$$

$$y - 2 = 3(x - 1)$$

$$y - 2 = 3x - 3$$

$$+2 \quad +2$$

$$y = 3x - 1$$

$$\perp m: -\frac{1}{3}$$

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

Aug 24-10:31 AM