

Math 3 Honors Pre-Calc: Lines Chapter

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I grappled with the overall note taking process. I wanted to make it as neat and easy to understand as possible so I had to maintain nice handwriting and clear language. I also highlighted important equations in pink and key information in yellow. I believe this made it easier for a reader to grasp the concepts by just skimming through the notes.

I used organization; as explained in the answer above, I tried my hardest to organize my note to make them neat and easy to understand.

Beautiful notes and problem set

Prerequisites for calculus
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Honors Notes Chap 1

EXPONENTIAL FUNCTIONS
↳ used to model ~~both~~ dramatically growing or decaying situations
↳ such as power plants
↳ Essential questions revolving around nuclear power plants will be answered in this exploration

OVERVIEW -
Functions & parametric equations make it easier to translate real world situations in mathematical terms

INCREMENTS - (sections of slope)
↳ increments are useful for identifying the slope (rate of change Δ) in a given quantity.
↳ increments are found by subtracting the coordinates of the starting value excluding.

↳ definition -
 $\Delta x = x_2 - x_1$ and $\Delta y = y_2 - y_1$
(Δ = "delta" or "rate of change")
ex. on next →

EXAMPLE - (using the Point-Slope Equation)
write an equation for the line $(-2, -1)$ and $(3, 4)$.
The line's slope is -
 $m = \frac{4 - (-1)}{3 - (-2)} = \frac{5}{5} = 1$

We can use this slope with either of the two given points in the point-slope equation for $(x_1, y_1) = (-2, -1)$, we obtain
 $y = 1 \cdot (x - (-2)) + (-1)$
 $y = x + 2 + (-1)$
 $y = x + 1$

y -intercept is where the y -axis is intercepted by a non-vertical line

Definition - Slope-Intercept Equation
 $y = mx + b$
is the slope-intercept equation of the line with slope m and y -intercept b .

Finding increments

EXAMPLE -

The coordinates increments from $(4, -3)$ to $(2, 5)$ are:
 $\Delta x = 2 - 4 = -2$, $\Delta y = 5 - (-3) = 8$
increments can be +, -, or 0.

SLOPE OF A LINE -

Slope can be found by calculating increments.

Definition (Slope)

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Parallel & Perpendicular Lines

↳ Parallel lines form equal angles with the x-axis. Therefore they have same slope.

↳ The slope of a perpendicular will be the negative or positive reciprocal.

EXAMPLE - (Writing equation for lines)

Write an equation for the line through the point $(-1, 2)$ that is (a) parallel, and (b) perpendicular to the line l :
 $y = 3x - 4$

(a) The line $y = 3(x+1)+2$ or $y = 3x + 5$, passes through the point $(-1, 2)$, and is parallel to l because it has a slope 3.

(b) The line $y = (-1/3)(x+1)+2$ or $y = (-1/3)x + 5/3$, passes through the point $(-1, 2)$, and is perpendicular to l because it has slope $(-1/3)$.

If A and B are not both zero, the graph of the equation $Ax + By = C$ is a line. Every line has an equation in this form, even lines with undefined slopes.

Definition - General Linear Equation

The equation -
 $Ax + By = C$ (A and B not both 0)
in a general linear equation
in x and y .

Analyzing and Graphing A General Linear Equation

Find slope + y intercept

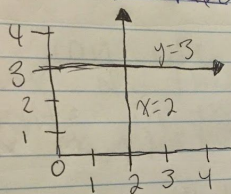
$$8x + 5y = 20$$
$$\rightarrow 5y = -8x + 20$$
$$y = \frac{8}{5}x + 4$$

This form reveals: slope $-\frac{8}{5}$
and $b = 4$

EQUATIONS OF LINES

The vertical line has
definition $x = a$. Similarly,
horizontal has definition
 $y = b$.

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



Definition (Point Slope Equation)

the equation -
 $y = m(x - x_1) + y_1$

is the point-slope equation of
the line through the point (x_1, y_1)
with slope m .

EXAMPLE - (Using Point slope equation)
Point $(2, 3)$ with slope $-\frac{3}{2}$.

$$y = -\frac{3}{2}(x - 2) + 3 \text{ or } y = -\frac{3}{2}x + 6$$


natural number

Problem sets

1.) Find the value of y if $x=3$
 $y = -2 + 4(3-3)$
 $\hookrightarrow \boxed{-2}$

3.) $x=5$ $y=2$ $m = \frac{y-3}{x-4}$
 $\hookrightarrow m = \frac{2-3}{2-4} = \boxed{\frac{1}{2}}$

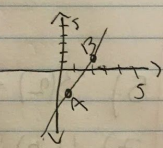
5.) $3(2) - 4(\frac{1}{4}) = 5 \checkmark \boxed{9}$

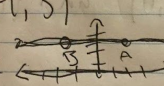
7.) $(1,0)$ and $(0,1)$
 $\sqrt{2}$ 

9.) $4x - 3y = 7$
 $+3y \quad \hookrightarrow \quad \frac{4x-7}{3} = \frac{3y}{3}$
 $\hookrightarrow \boxed{y = \frac{4}{3}x - \frac{7}{3}}$

1.) $A(1,2)$ $B(-1,-1)$
 $\frac{-1-1}{-1-2} = \frac{-2}{-3} \rightarrow x \Delta$
 $\rightarrow y \Delta$

3.) $A(-3,1)$ $B(-8,1)$
 $\frac{-3+8}{1-1} = \frac{5}{0} \rightarrow x \Delta$
 $\rightarrow y \Delta$

5.) $A(1,-2)$ $B(2,1)$
 $a \quad b \quad c$
 $\frac{1-2}{-2-1} = \frac{-1}{-3}$ 

7.) $A(2,3)$ $B(-1,3)$
 no slope 

9.) (a) $P(2,3) \rightarrow \boxed{x=2}$ (b) $\boxed{y=3}$

11.) $P(0, -\sqrt{2}) \rightarrow \boxed{x=0}$ $\boxed{y=-\sqrt{2}}$

13.) point slope equation $= y - 1 = 1(x - 1) + 1$
 $P(1,1)$ $m=1$

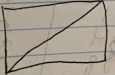
15.) point slope $m = y - 2 = 2(x - 6) + 3$
 $P(6,3)$ $m=2$

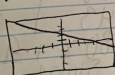
17.) linear equation = $3x - 2y = 0$
 (0,0) (2,3)


19.) linear equation = $x = -2$
 (-2,0) (-2,-2)

21.) Slope intercept equation = $y = 3x - 2$
 $m = 3$ $b = -2$

23.) Slope intercept = $y = -\frac{1}{2}x - 3$
 $m = -\frac{1}{2}$ $b = -3$

25.)  $y = \frac{5}{2}x$

27.)  (a) $-\frac{3}{4}$ (b) 3

29.)  (a) $-\frac{4}{3}$ (b) 4

31.) a) $y = -x$ b) $y = x$
 p(0,0) 2: $y = -x$

33.) a) $x = 2$ b) $y = 4$
 p(2,4) 2: $x = 5$

35.)

m	x	1	3	5
int	for	2	9	16

 $m = \frac{7}{2}$ $b = \frac{3}{2}$

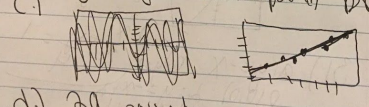
37.) a) (-2,3) b) (4,y)
 $m = -\frac{2}{3}$ $y = -1$

39.)

age (months)	Weight (pounds)
19	27
21	23
24	25
27	28
29	31
31	28
34	32
38	34
43	39

a) $y = 0.680x + 9.013$

b) The slope is 0.680.
 It represents the average weight gain in pounds per month



d.) 20 pounds

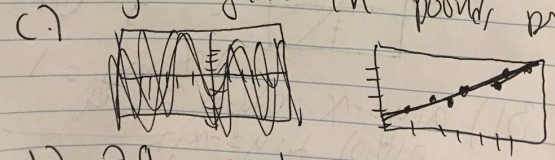
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