BAKER CHARTERS SCHOOL

HONORS ALGEBRA 2B

Baker Web Academy School Notes

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Contents

CHAPTER ONE

Graphs and Functions

Unit 1

Feb 21 2022 Mon (11:15:44)

Lesson 1: Writing parallel and perpendicular   **Unit 1**

Consider the line: $y = -2x + 1$.

Let's:

- Find the equation of the line that is parallel to this line and passes through the point $(7, -5)$.

- Find the equation of the line that is perpendicular to this line through the point $(7, -5)$.

Let's first go over these Properties:

> **Property 1.** (Parallel Slope Property) Two non-vertical lines are parallel if and only if they have the same slope.

> **Property 2.** (Perpendicular Slope Property) Two non-vertical lines are perpendicular if and only if the product of their slopes is equal to -1.

Now, to equation $y = -2x + 1$ is written in the slope-intercept form: $y = mx + b$. In this form, the slope m is -2.

- We can use the **Parallel Slope Property**. Since the given lines has a slope of -2, a line parallel to it must also have the same slope, which is -2. So, the equation of the parallel line will have the form $y = -2x + b$. The line passes through $(7, -5)$, so we use $x = 7$ and $y = -5$ to solve for b:

$$\begin{aligned}
y &= -2x + b \\
-5 &= -2(7) + b \\
-5 &= -14 + b \\
b &= 9
\end{aligned} \tag{1.1}$$

Now, we know the equation of the parallel line, which is $y = -2x + 9$.

- We use the **Perpendicular Slope Property**. Since the given lines has the slope -2, a line with the slope $\frac{1}{2}$ is perpendicular to it.

  So, the equation of the perpendicular line will have the form $y = \frac{1}{2}x + b$.

  The line passes through $(7, -5)$, so we use $x = 7$ and $y = -5$ to solve for b.

$$\begin{aligned}
y &= \frac{1}{2}x + b \\
-5 &= \frac{1}{2}(7) + b \\
-5 &= \frac{7}{2} + b \\
-\frac{10}{2} &= \frac{7}{2} + b \\
b &= -\frac{17}{2}
\end{aligned} \tag{1.2}$$

Equation of the parallel line: $y = -2x + 9$

Equation of the perpendicular line: $y = \frac{1}{2}x - \frac{17}{2}$

Feb 21 2022 Mon (12:24:44)

Lesson 2: Solving a linear equation by graphing   **Unit 1**

Let's look at this equation:

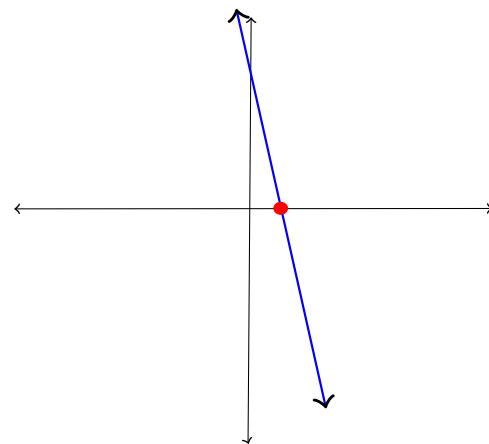$$-4 = 5 - 3x. \tag{1.3}$$

Here's one method to solve it (by graphing):

- First, we write the equation with 0 on one side

$$\begin{aligned}-4 &= 5 - 3x \\ 0 &= 9 - 3x\end{aligned}. \tag{1.4}$$

- Then, we graph the equation and find the **x-intercept**:

x	$y = -3x + 9$	(x, y)
0	$y = -3 \times 0 + 9 = 9$	$(0, 9)$
1	$y = -3 \times 1 + 9 = 6$	$(1, 6)$
2	$y = -3 \times 2 + 9 = 3$	$(2, 3)$

Table 1.1: X-Y Table

We get that $x = 3$ is a solution to the original equation, which was $-4 = 5 - 3x$

Feb 27 2022 Sun (15:34:39)

Lesson 3: Identify correlation and causation　　　　　**Unit 1**

> **Definition 1.** (Correlation) A mutual relationship or connection be-
> tween two or more things.
> Two quantities have a *correlation* if they tend to vary together.

> **Definition 2.** (Causation) This indicates a relationship between two
> events where one event is affected by the other.

Let's take a look at a couple of examples for each definition:

> **Example.** Maria and Andy are high school students in Arizona. Andy
> always gets an A on his math test when it's sunny outside.
> You may think that Andy is acing his test because it's sunny when he
> takes the test, but that's not true. It just happens that it's sunny when
> there's a math test.
> So, the two events: The sunniness and the acing his test occurred
> together without one causing the other. In simpler terms, the two
> events are **Correlated**, but there's no **Causal** relationship between
> them.

> **Remark.**
> $$\text{Correlation} \quad \neq \quad \text{Causation}$$
> .

CHAPTER TWO

Linear Systems

Unit 2

CHAPTER THREE

Exponents and Polynomials

Unit 3

Feb 21 2022 Mon (10:17:30)

Lesson 1: Factoring a sum or difference of two cubes   **Unit 3**

Let's factor:

$$v^3 + 27. \tag{3.1}$$

We can use the following formulas to factor the sum or difference of two cubes:

$$\text{Sum of two cubes:} \quad a^3 + b^3 = (a + b)(a^2 - ab + b^2) \tag{3.2}$$
$$\text{Difference of two cubes:} \quad a^3 - b^3 = (a - b)(a^2 + ab + b^2). \tag{3.3}$$

We need to factor: $v^3 + 27$.

> **Remark.** (27) Notice how 27 can be written as $27 = 3^3$.
> So, $v^3 + 27$ is the sum of two cubes:
>
> $$v^3 + 27 = v^3 + 3^3. \tag{3.4}$$

We can use the formula for the sum of two cubes to factor $v^3 + 3^3$:

$$\begin{aligned}
a^3 + b^3 &= (a + b)(a^2 - ab + b^2) \\
&= (v + 3)(v^2 - v \times 3 + 3^2) \quad \text{Letting } a = v \text{ and } b = 3 \\
&= \boxed{(v + 3)(v^2 - 3v + 9)}
\end{aligned} \tag{3.5}$$

CHAPTER FOUR

Quadratic and Polynomial Functions

Unit 4

CHAPTER FIVE

Rational Expressions

Unit 5

CHAPTER SIX

Exponential and Logarithmic Functions

Unit 6

CHAPTER SEVEN

Statistics and Probability

Unit 7

CHAPTER EIGHT

Sequences and Conics

Unit 8

CHAPTER NINE

Trigonometry

Unit 9

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