This document contains explanations of notation and definitions that we may go over quickly in lecture. If you were confused about notation or think you missed a definition, look here!

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- **Def** An integer $n$ is <u>divisible</u> by integer $m$ if there exists an integer $k$ such that $n = mk$.

We sometimes say "$m$ divides $n$" to mean the same thing as "$n$ is divisible by $m$".

We use the shorthand $m|n$ to say $m$ divides $n$.

Another equivalent definition of divisibility is that $m|n$ if and only if $\frac{n}{m}$ is an integer.

**ex** $0$ ($\leftarrow n$) is divisible by $2$ ($\leftarrow m$) because we can choose $k=0$ and write $0 = 2 \cdot 0$.

5 is not divisible by 4 because there is no integer $k$ so that $5 = 4k$.

$-33$ is divisible by $11$ because $-33 = 11 \cdot (-3)$.

- The ellipsis (…) notation in math:

… means "continuing onward in the same manner."

So $1, 2, \ldots, 99, 100$ means "all of the integers between 1 and 100."

By convention, we put two items at the start (here, 1 and 2) and two at the end to be very explicit about the pattern. But in general, look at examples and use your own judgment about how to use … .

ex $-100, -98, \ldots, -4, -2$ even negative integers between $-100$ and $-2$

$\ldots -2, -1, 0, 1, 2, \ldots$ all integers

$c_0 x_0 + c_1 x_1 + c_2 x_2$ polynomials up to degree 2

$c_0 x_0 + c_1 x_1 + \cdots + c_{k-1} x_{k-1} + c_k x_k$ polynomials of degree $k$

- Exponent math rules.

We can simplify expressions with exponents as long as they share the same base!

ex $5^{8}$ ← exponent, base: 5 divided by $5^{2}$ is $\frac{5^{8}}{5^{2}} = 5^{6}$.

$$X^{10} \cdot X^{11} = X^{21}$$

$$\frac{10^{K}}{100} = \frac{10^{K}}{10^{2}} = 10^{K-2}$$

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- Def A rational number is a real number that can be expressed as a ratio $n/m$ of integers $n$ and $m$ where $m \neq 0$.

ex 1.2 is rational because we can choose $n = 6$ and $m = 5$ so that $1.2 = n/m = 6/5$.

$-5$ is rational because $-5 = -5/1$.

$\pi$ is not rational.

$0.33\ldots$ is rational because it equals $1/3$.

- **Def** The absolute value of a number $x$, written $|x|$, is the distance from $x$ to 0, disregarding the sign of $x$.

ex $|5| = 5$

$|-5| = 5$

$|-1.2| = 1.2$

- **Def** Given a proposition of the form "if a then b", its converse is the proposition "if b then a."

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- **Def** An integer $n$ is odd iff there is an integer $k$ such that $n = 2k+1$.

ex $-11$ is odd because $-11 = 2(-6)+1$
10 is not odd because there is no integer $k$ so that $10 = 2k+1$.

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- **Def** A positive integer $n > 1$ is prime if the only positive integers that evenly divide $n$ are one and $n$ itself. A positive integer $n > 1$ is composite if it is not prime.