Def. Proposition is a statement that is true or false.
Example: $2 + 2 = 4$ (true)
Example: $2 + 2 = 5$ (false)

Ex. For every non-negative integer $n$, $n^2 + 1$ is prime. If $n$ is divisible by 1, then $n$ is 1.

$p(0)$: $43$ (true)
$p(2)$: $47$ (true)
$p(3)$: Not all primes

Def. For all differentiable functions $f$, $g$

Example: $\frac{df}{dx}(x^3) = \frac{df}{dx}(x^{3/2}) + \frac{df}{dx}(x^{1/2})$

Product Rule: $\frac{d}{dx}(fg) = \frac{d}{dx}(f)g + f\frac{d}{dx}(g)$ (true)

Example: If $a$, $b$, $c$, $d$ are positive integers

$a | b \iff a^2 | b^2$ (false)

Euler’s conjecture

$a^4 + b^4 + c^4 = d^4$ for $a, b, c, d$ integers

Counterexample on page 2.

Def. Predicate: a proposition that depends on one or more variables.
Example: $n$ is a perfect square
Let variable
$P(n)$: $n$ is a perfect square
$P(4)$: True $P(5)$: False

Def. Axiom: proposition accepted as being true (does not need to be proved)

Theorems, Lemmas, Claims: types of propositions

Sketch work:

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>3.25</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Theorem: $d \neq 0$.

Proof: If $d \leq 2$, then $x \geq 0$, $x^2 + y^2 \geq 0$.

Counterexample on page 2.