This lecture’s notes illustrate some uses of various \LaTeX macros. Take a look at this and imitate.

1.1 Some theorems and stuff

We now delve right into the proof.

**Lemma 1.1.** This is the first lemma of the lecture.

*Proof.* The proof is by induction on . . . . We also throw in a figure (which you might want to make larger).

![Figure 1.1: A Figure](image)

This is the end of the proof, which is marked with a little box.

1.1.1 A few items of note

Here is an itemized list:

- this is the first item;
- this is the second item.

Here is an enumerated list:

1. this is the first item;
2. this is the second item.

Here is an exercise:

**Exercise:** Find an efficient algorithm for triangulation.
Here is how to define things in the proper mathematical style. Let $f_k$ be the AND – OR function, defined by

$$f_k(x_1, x_2, \ldots, x_{2^n}) = \begin{cases} x_1 & \text{if } k = 0; \\ \text{AND}(f_{k-1}(x_1, \ldots, x_{2^{n-1}}), f_{k-1}(x_{2^{n-1}+1}, \ldots, x_{2^n})) & \text{if } k \text{ is even; } \\ \text{OR}(f_{k-1}(x_1, \ldots, x_{2^{n-1}}), f_{k-1}(x_{2^{n-1}+1}, \ldots, x_{2^n})) & \text{otherwise.} \end{cases}$$

Here is another equation that uses one of the AMS commands, align

$$p(x_1, x_5) = \sum_{x_{2,3 \ldots}} p(x_1)p(x_2|x_1)p(x_3|x_1)p(x_4|x_2)p(x_5|x_1)p(x_6|x_2, x_5)$$
$$= p(x_1) \sum_{x_2} p(x_2|x_1) \sum_{x_3} p(x_3|x_1) \sum_{x_4} p(x_4|x_2) \sum_{x_5} p(x_5|x_1)p(x_6|x_2, x_5)$$
$$= p(x_1) \sum_{x_2} p(x_2|x_1) \sum_{x_3} p(x_3|x_1) \sum_{x_4} p(x_4|x_2) \sum_{x_5} p(x_5|x_1)\phi_{x_5}(x_2, x_5)$$

which assumes that $X_4 \perp \{X_1, X_3\}|X_2$.

**Theorem 1.2.** This is the first theorem.

**Proof.** This is the proof of the first theorem. We show how to write pseudo-code now.

Consider a comparison between $x$ and $y$:

```plaintext
if x or y or both are in S then
  answer accordingly
else
  Make the element with the larger score (say x) win the comparison
  if $F(x) + F(y) < \frac{n}{2}$ then
    $F(x) \leftarrow F(x) + F(y)$
    $F(y) \leftarrow 0$
  else
    $S \leftarrow S \cup \{x\}$
    $r \leftarrow r + 1$
  endif
endif
```

This concludes the proof. □

### 1.2 Next topic

Here is some citations [JB00] and [L2000]

**References**