1 Getting Started

Overleaf (https://www.overleaf.com) is a great place to start. It is a web-based WYSIWYG (what-you-see-is-what-you-get) environment, and it provides some very useful tutorials.

2 Math stuff

Here's the source for the first question on your assignment 1:

Prove each of the following *using the definitions of* Big-Oh / Big-Omega / Big-Theta.

- If $f \in \mathcal{O}(g)$ and $g \in \mathcal{O}(h)$ then $f \in \mathcal{O}(h)$, for all functions f, g, h in $\mathbb{N} \to \mathbb{R}^+$.

- If $f_1 \in \mathcal{O}(g_1)$ and $f_2 \in \mathcal{O}(g_2)$ then $f \in \mathcal{O}(g)$, where $f(n) = f_1(n) \cdot f_2(n)$, $g(n) = g_1(n) \cdot g_2(n)$, for all functions f_1, f_2, g_1, g_2 in $\mathbb{N} \to \mathbb{R}^+$.

- $2^{2n} \notin \mathcal{O}(2^n)$.

- If $f_1 \in \mathcal{O}(g)$ and $f_2 \in \mathcal{O}(g)$ then $f_{\max} \in \mathcal{O}(g)$, where $f_{\max}$ is defined by $f_{\max}(n) = \max(f_1(n), f_2(n))$, for all functions f_1, f_2, g in $\mathbb{N} \to \mathbb{R}^+$.

If we wanted a numbered list, we would have used the **enumerate** environment:

1. If $f \in \mathcal{O}(g)$ and $g \in \mathcal{O}(h)$ then $f \in \mathcal{O}(h)$, for all functions f, g, h in $\mathbb{N} \to \mathbb{R}^+$.

2. ...

3 Proof stuff

Here's one way to structure a proof:

Lemma 1. What to prove goes here.

Proof. And the proof goes here. □

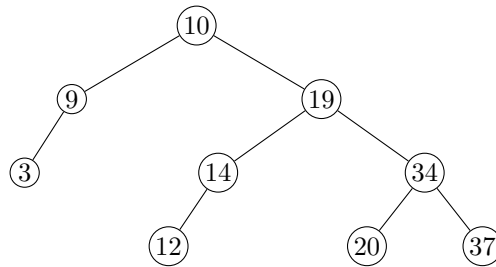**Lemma 2.** What to prove goes here.

Proof. And the proof goes here. □
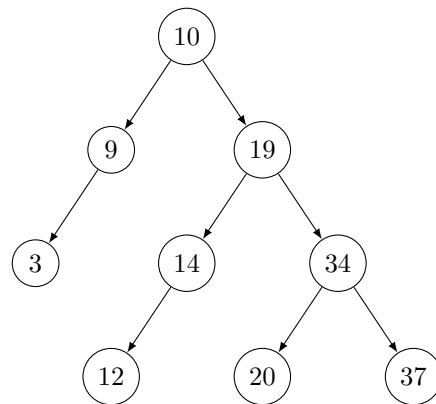
Theorem 1. What to prove goes here.

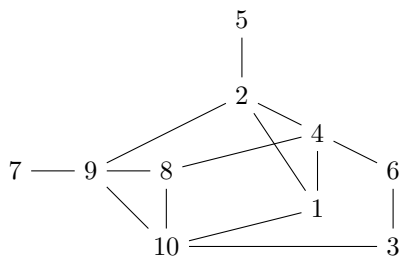*Proof.* And the proof goes here. □

4   Trees and Graphs

My favourite way to draw a tree quickly:

A longer, but super flexible and customizable way:

Here's a graph:

And a more complicated graph: