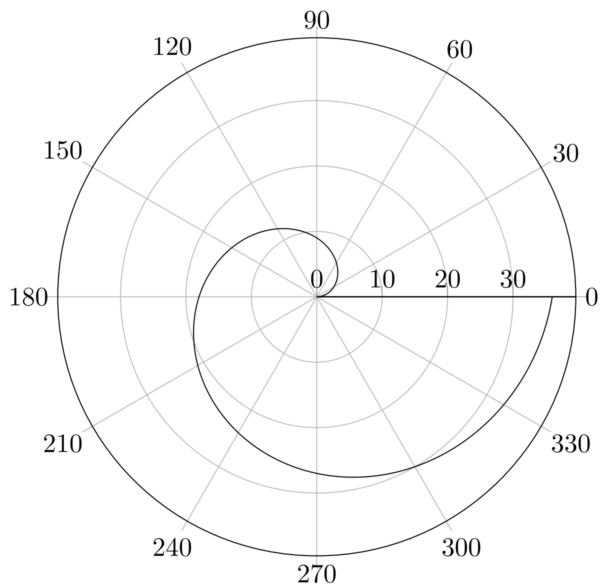
This shall be a fun exercise. I will need to learn how to produce a tree diagram in LaTeX as well as a TikZ picture of a golden spiral overlaid atop a snail (at the very least).

To accomplish the latter I shall leverage the arc length of a curve as $\theta_1 \to \infty$ for $l$, where

$$l = \int_{\theta_0}^{\theta_1} \sqrt{[f(\theta)]^2 + [f'(\theta)]^2} \mathrm{d}\theta$$

Then for a given curve such as $r = e^{\frac{\theta}{10}}$:




The length of the arc is:

$$\begin{aligned}
l &= \int_0^{\theta_1} \sqrt{(e^{-\frac{\theta}{10}})^2 + (-\frac{1}{10}e^{-\frac{\theta}{10}})^2} \mathrm{d}\theta \\
&= \int_0^{\theta_1} \sqrt{(1 + \frac{1}{100})e^{-\frac{2\theta}{10}}} \mathrm{d}\theta \\
&= \frac{\sqrt{101}}{10} \int_0^{\theta_1} e^{-\frac{\theta}{10}} \mathrm{d}\theta \\
&= \sqrt{101}(1 - e^{-\frac{\theta_1}{10}}). \\
&= \sqrt{101} \text{ (as } \theta_1 \to \infty)
\end{aligned}$$



*written exclusively under the influence*