Lab #2: Graph Control in Makie

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I. Topic

The main topic of this lab is to manipulate the sine wave parameters, namely: amplitude, frequency and phase, in **Makie**, which is an interactive graphics library that allows for the creation and manipulation of high-quality visualizations.

Exo 1: Case of Sine Wave

Consider the code shown hereafter, in which we cant to control and dynamically update the *amplitude*, *frequency* and *phase* of a sine wave. Those settings are represented by reactive variables, called **Observables**. The resulting interactive graph is shown in Figure 1. By changing each slider, we automatically update and trigger some actions *(e.g., y-limits)* in response to changes in its value.

```
using JSServe
JSServe.configure_server!
(listen_url="localhost", forwarded_port=9384)
Page()

using Makie: Slider

using WGLMakie # Web-based backend
# http://localhost:9384/browser-display

# Create a figure window
set_theme!(theme_dark())
fig = Figure()
ax = Axis(fig[1, 1:3], title="∿", xlabel="x",
ylabel="y")

# Create sliders to control the parameters of a
sinewave
amp = Slider(fig[2,1], range=0:.1:5, startvalue=.
5) # Amplitude
freq = Slider(fig[2,2], range=1:100,
startvalue=1) # Frequency
phi = Slider(fig[2,3], range=-π:0.1:π) # Phase

# Generate (x, y)-values
x = lift(n -> range(0, stop=2π, length=100*n),
freq.value)
y = lift((x, a, f, p) -> a .* sin.(f .* x .+ p),
x, amp.value, freq.value, phi.value)

# Update the plot based on each slider value
lines!(ax, x, y)

# Update `y` limits depending on the amplitude
vlim = lift(l -> l+.25, amp.value)
on(vlim) do vlim
        ylims!(ax, -vlim, vlim)
end

# Show the figure
display(fig)
```

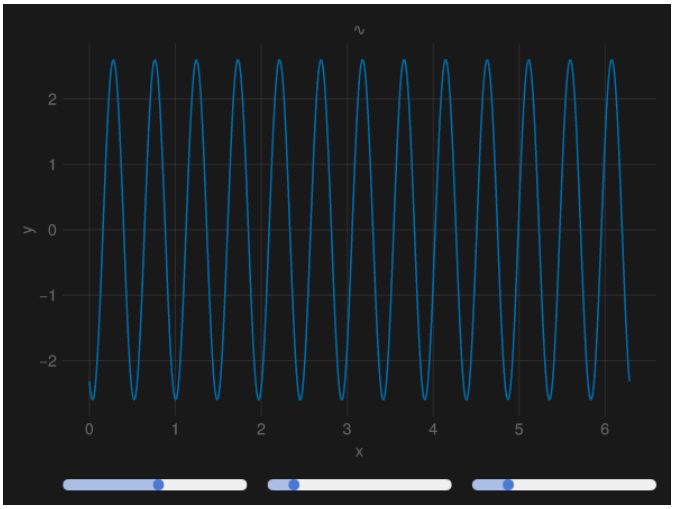

Figure 1: Makie -> Sine wave

You are asked to add formatted annotations to the:

1. amplitude slider:
   - The word *Amplitude* to the left
   - The corresponding value to the right.
2. frequency slider
   - The word *Frequency* to the left
   - The corresponding value to the right, along with the unit of measure.
3. phase slider
   - The word *Phase* to the left

- The corresponding value to the right, along with the unit of measure.