

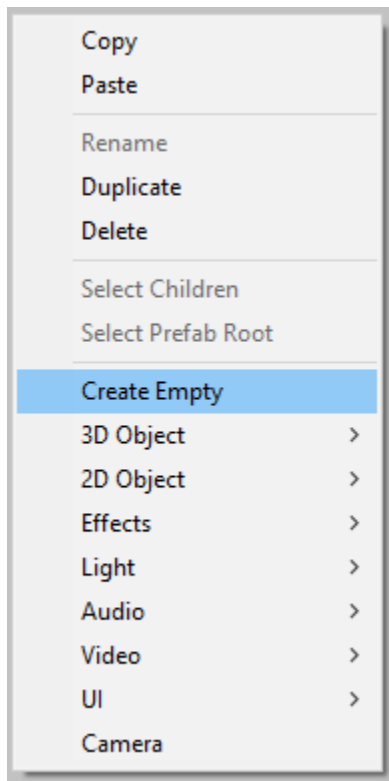
Contact Email: [chihyunsong.com@gmail.com](mailto:chihyunsong.com@gmail.com)

## Demo

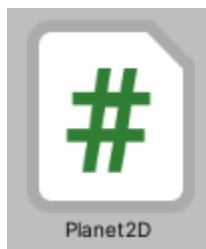
- Go to “Settings” folder
- There are four instances of Planet Settings Scriptable Object
- Drag and drop one of the instances to Planet Settings in Planet2D.cs on “example planet” Game Object
- Click “Create Planet”

## Create a 2D Planet from Scratch

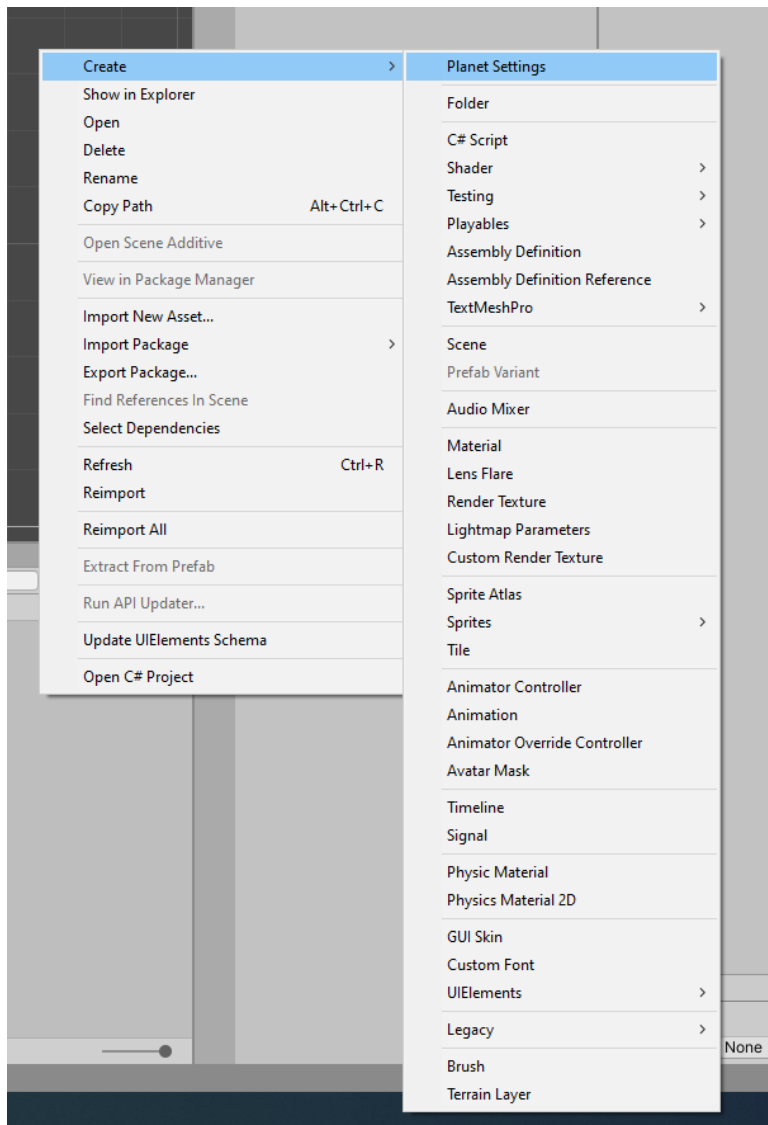
- Create an Empty Game Object



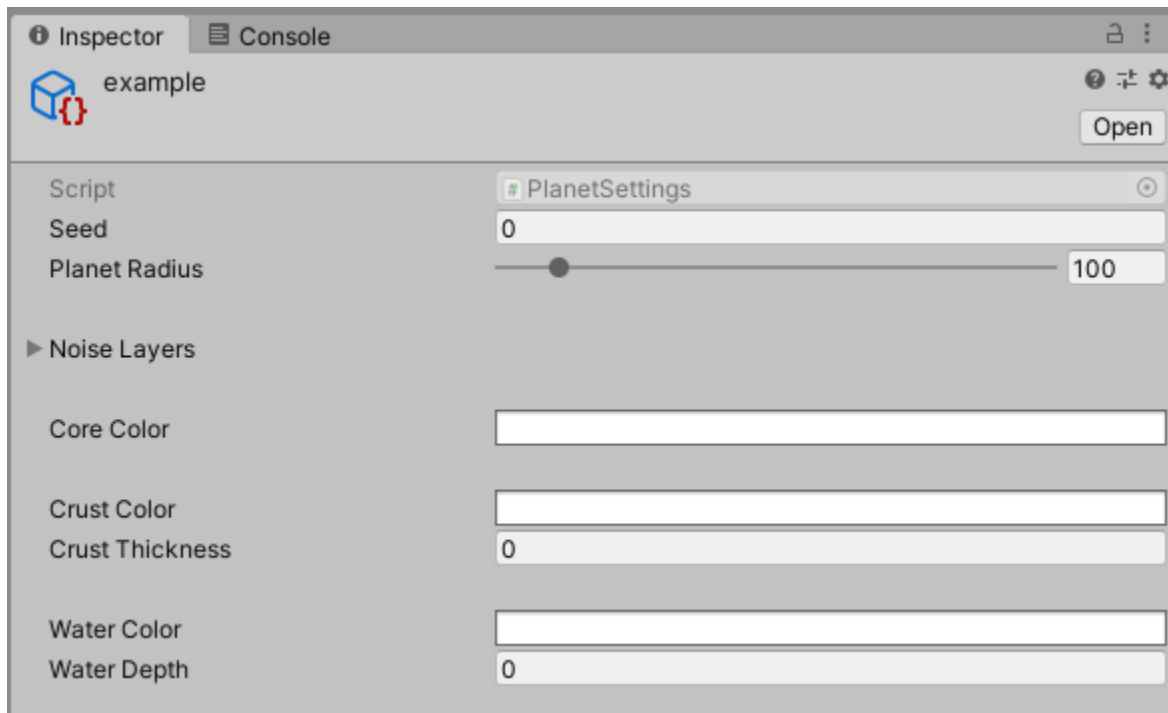
- Drag and drop Planet2D.cs into the Empty Game Object



- Create an instance of Planet Settings Scriptable Object and drag drop into Planet2D.cs



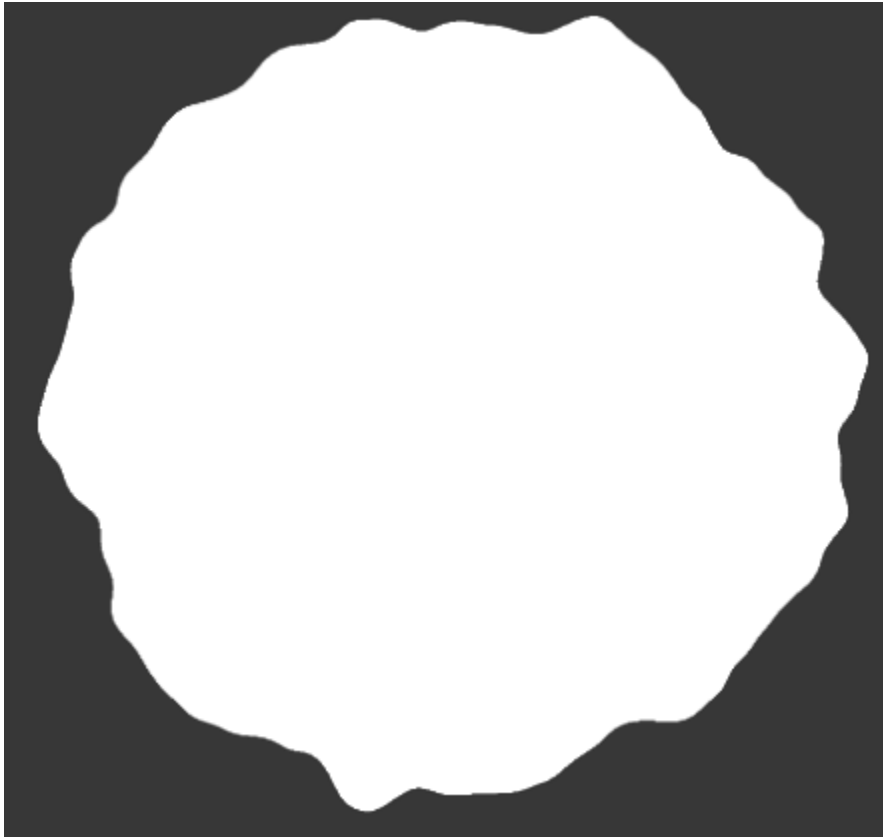
- Initially, your instance of Planet Setting should look like this



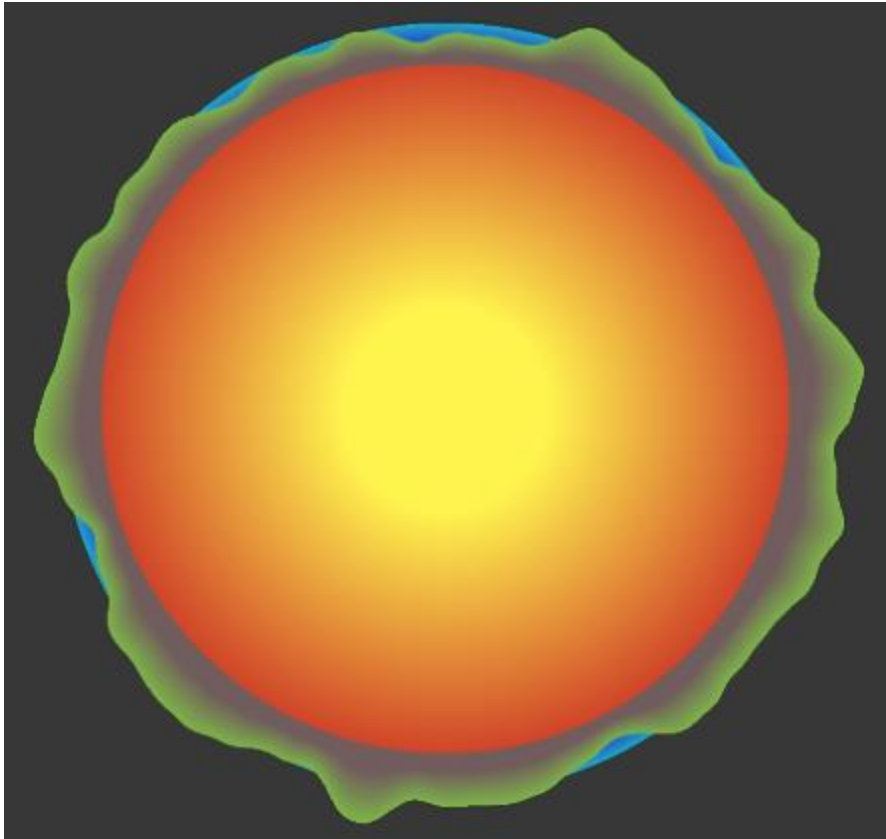
- Click “Create Planet” and you should see a circle
- There is no fluctuation in the elevation because amplitude and frequency are zero



- Try changing some values especially radius, amplitude and frequency. Then, click “Create Planet”
- Your planet should no longer be a circle



- Apply color to your planet
- Core Color colors the planet from the center to the surface.
- Crust Color colors the planet from surface to the center given its Thickness.
  - o If Thickness is 0, then crust will not exist.
  - o The rate of gradient across the crust will depend on elevation of the crust.
- Water Color allows you to decide color of the water
  - o Water level starts at the lowest point of the planet. Water depth is capped at 300.



- You can export the result as PNG. Simply write your path and .png at the end.

This concludes a quick look into basic planet creation. I will go more in depth in the detailed look section.

## Detailed Look

**Seed:** Determines the start point in random generation. Same seed will create same planet every time.

**Radius:** Size of the planet. Can range from 1 to 1000.

**Size:** Determines the number of noises you are going to combine. This value is capped at 3. Combining multiple noise can be extremely important when you want to make sure the planet doesn't look similar on all sides.

**Noise Type:** There is essentially only one noise type, Perlin, but each selection has different ranges of values possible. Regular Perlin goes from -1 to 1. Perlin Positive goes from 0 to 1 and Perlin Negative goes from -1 to 0.

**Frequency:** High frequency will result in bumpier planet while low frequency will result in smoother looking planet.

**Amplitude:** Dictates maximum elevation or depression of the planet.

$\text{Elevation} = \text{Amplitude} * (\text{Noise Value} + 1) * \text{Radius}$

**Lacunarity:** changes frequency of every subsequent octave at a set rate

**Persistence:** changes amplitude of every subsequent octave at a set rate

**Side Note:** Lacunarity and Persistence is used to create detail of the terrain. Play around with the values to find the right look for you.

**Octaves:** Every octave is a single noise function and all octaves are combined to produce one final noise

where  $0 \leq i < \text{octave}$

$\text{octave}(i) \text{ frequency} = \text{frequency} * \text{lacunarity}^i$

$\text{octave}(i) \text{ amplitude} = \text{amplitude} * \text{persistence}^i$

All the octaves are combined together and normalized to -1 and 1 or 0 and 1 or -1 and 0 depending on the Noise Type you choose.

**Side Note:** persistence of 0 will make number of octaves irrelevant.

**Side Note:** persistence and lacunarity has no effect if octave is 1.

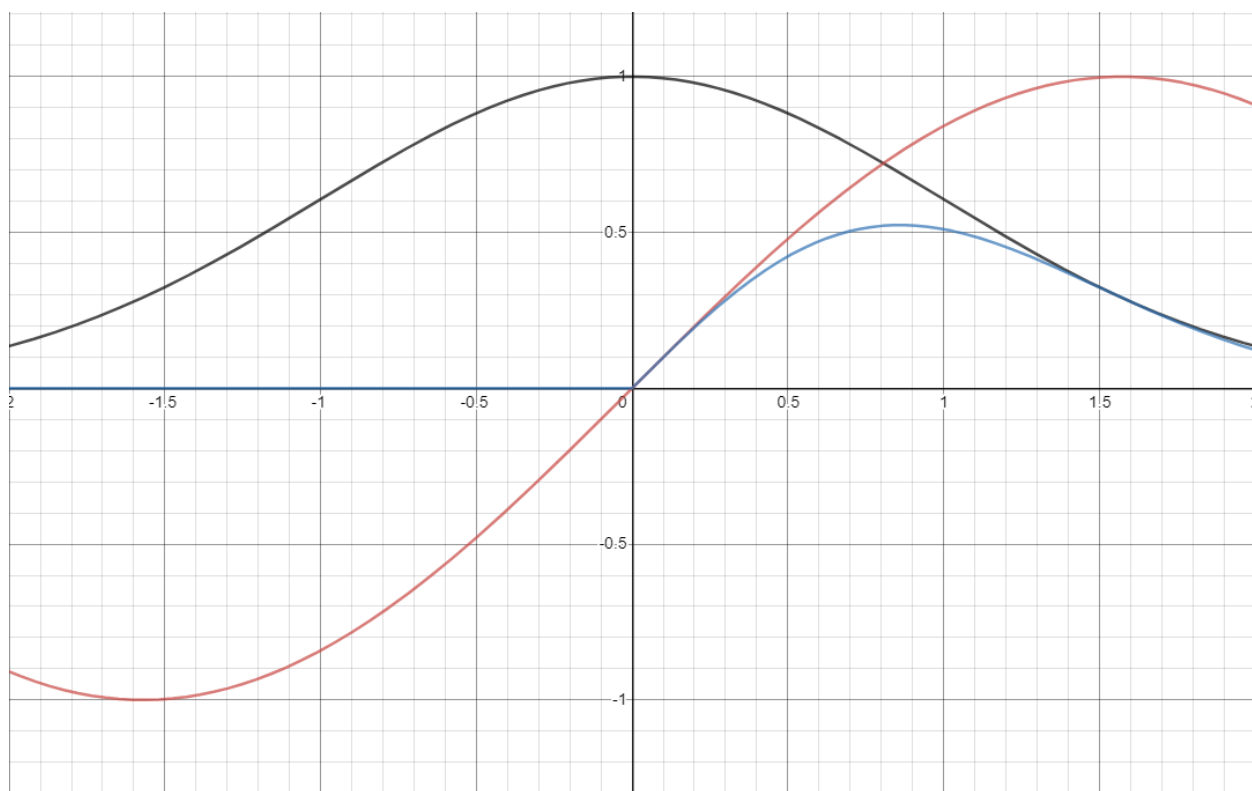
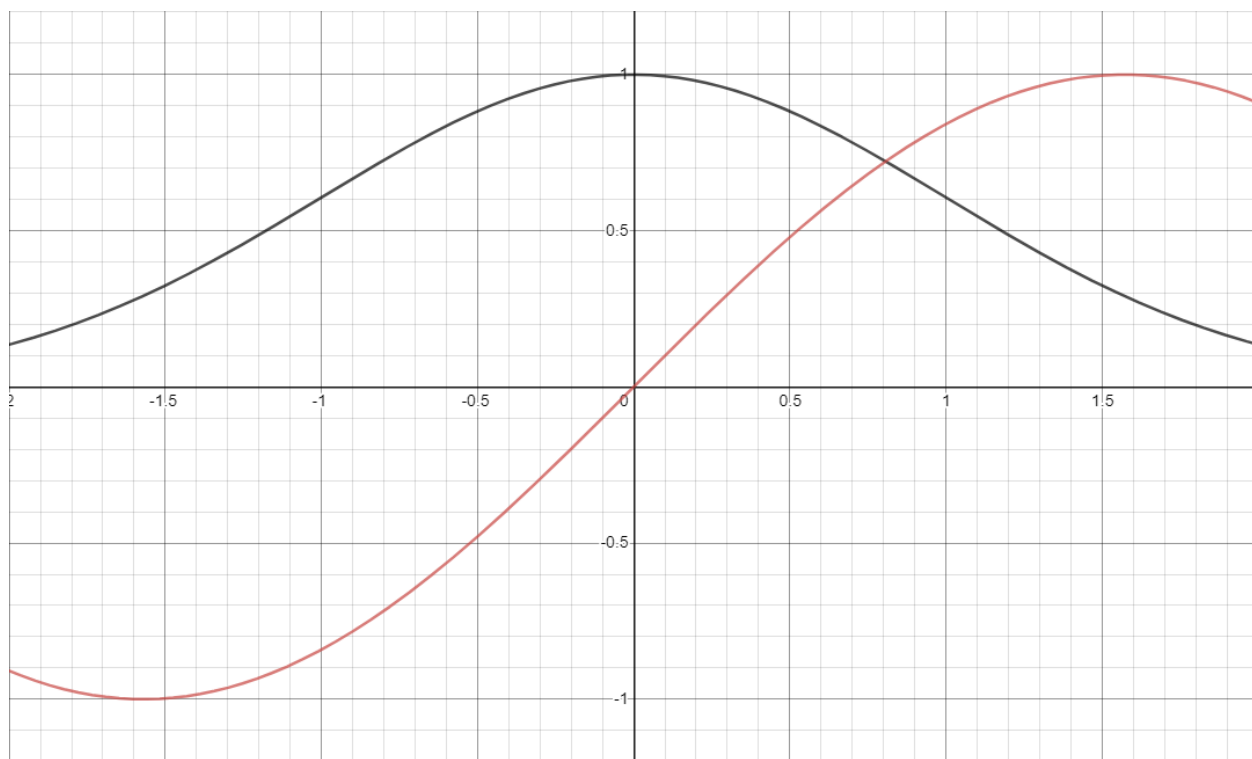
**Masked By:** **Value of -1 disables masking.** If you want Noise Layer 1 to be masked by Noise Layer 0, simply put 0 for "Masked By" on Noise Layer 1.

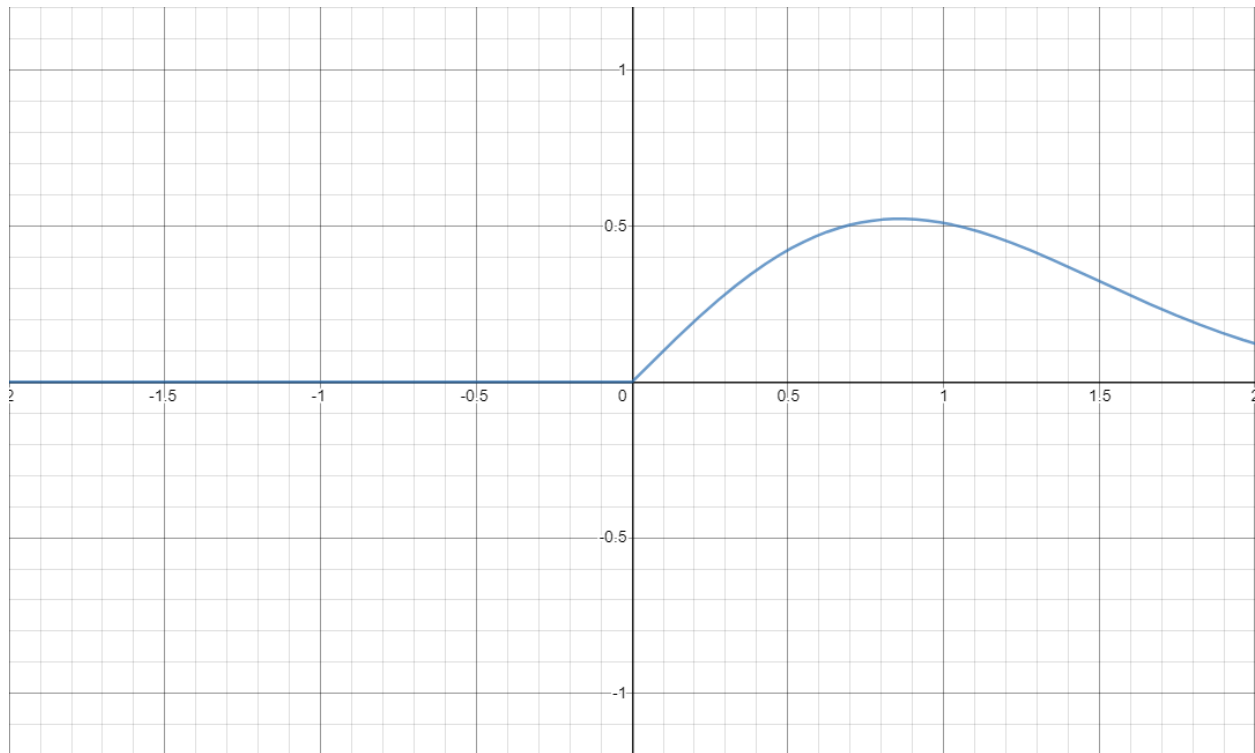
If Red function is masked by Black function and Blue represents the final Red function

$\text{Blue} = \text{Red} * \text{Black}$  (given blue and black sign is the same)

$\text{Blue} = 0$  (given blue and black sign is the different)

It is graphically shown below.





### **Useful Techniques to Create Good Looking Planet**

One very useful technique I use is the use of what I call phantom noise. Phantom noises have amplitude of zero, therefore they do not contribute to the look of the planet. However, phantom noises still have their noise values and you can have other noises that get masked by this phantom noise. This allows distinct zones of oceans and mountains. I used this technique on “alien” and “earth-like” instances of Scriptable Object.

It is important to realize that you can disable noises temporary to focus on one noise.