

# The Rose

Gina Reynolds, June 2021



I saw the rose posted recently by Antonio Sánchez Chinchón @aschinchon.

I liked what I was looking at, but didn't really 'get' what was going on - even with the code posted alongside.

I used that and other code posted by Alex as the basis for exploring w/ ggplot2 and flipbookr:

<https://cpastem.caltech.edu/documents/18024/ARt.nb.html>

# Overview

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- a grid of points

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- where x positions are offset based on the sin of y

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- a grid of points
- where x positions are offset based on the  $\sin$  of y
- and y positions are offset based on the  $\cos$  of x

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- a grid of points
- where x positions are offset based on the sin of y
- and y positions are offset based on the cos of x
- and the coordinate system is polar.

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## The rose/flower is ...

- a grid of points
- where x positions are offset based on the sin of y
- and y positions are offset based on the cos of x
- and the coordinate system is polar.
- Also, the sin and cosine waves accelerate

# First the x position.

## the x grid position is offset ...

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- and the pattern is reflected across the x axis

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## the x grid position is offset ...

- into a wave based on the sin of y
- and the waves accelerate moving away from the x axis, so actually  $y^2$
- *in ggplot2 updating x positions by overwriting with aes(x = ?) statements*
- and the pattern is reflected across the x axis
- *adding a geom\_point layer where the sign of y is negative*

```
seq(0, 4, by = .1)
```

```
[1] 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8  
[20] 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7  
[39] 3.8 3.9 4.0
```

```
seq(0, 4, by = .1) ->  
my_seq
```

```
seq(0, 4, by = .1) ->  
  my_seq  
  
tibble(x = my_seq)
```

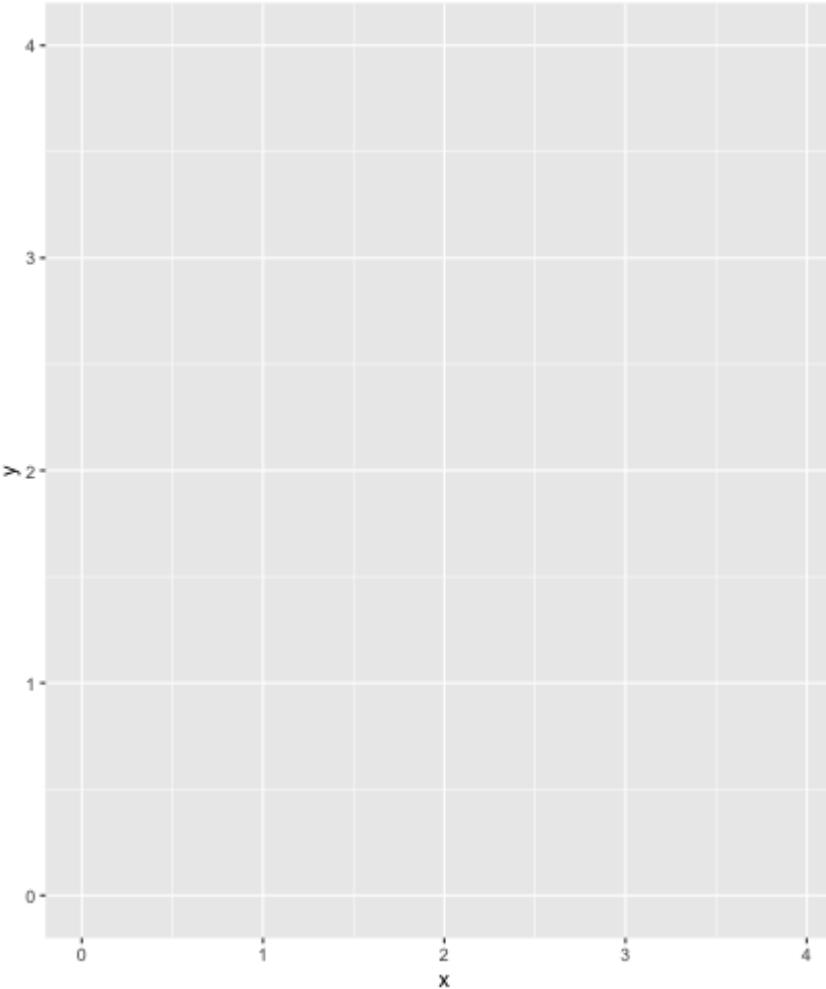
```
# A tibble: 41 x 1  
      x  
   <dbl>  
1     0  
2     0.1  
3     0.2  
4     0.3  
5     0.4  
6     0.5  
7     0.6  
8     0.7  
9     0.8  
10    0.9  
# ... with 31 more rows
```

```
seq(0, 4, by = .1) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq)
```

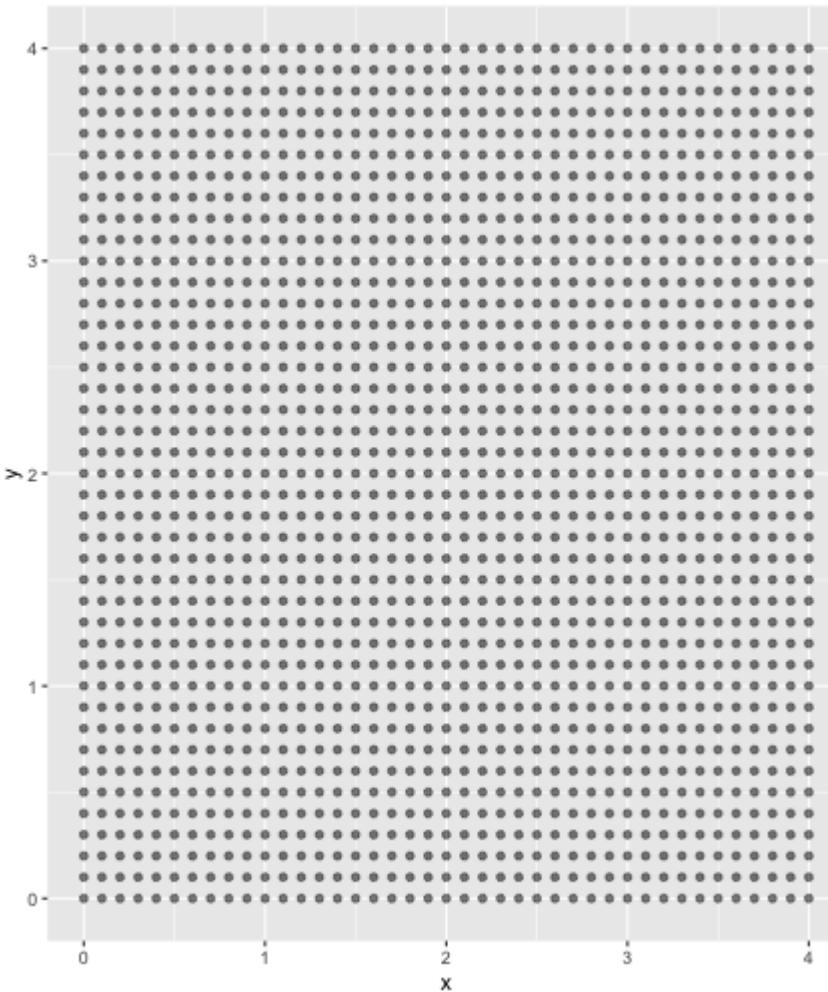
```
# A tibble: 1,681 x 2  
      x     y  
  <dbl> <dbl>  
1     0     0  
2     0     0.1  
3     0     0.2  
4     0     0.3  
5     0     0.4  
6     0     0.5  
7     0     0.6  
8     0     0.7  
9     0     0.8  
10    0     0.9  
# ... with 1,671 more rows
```

```
seq(0, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot()
```

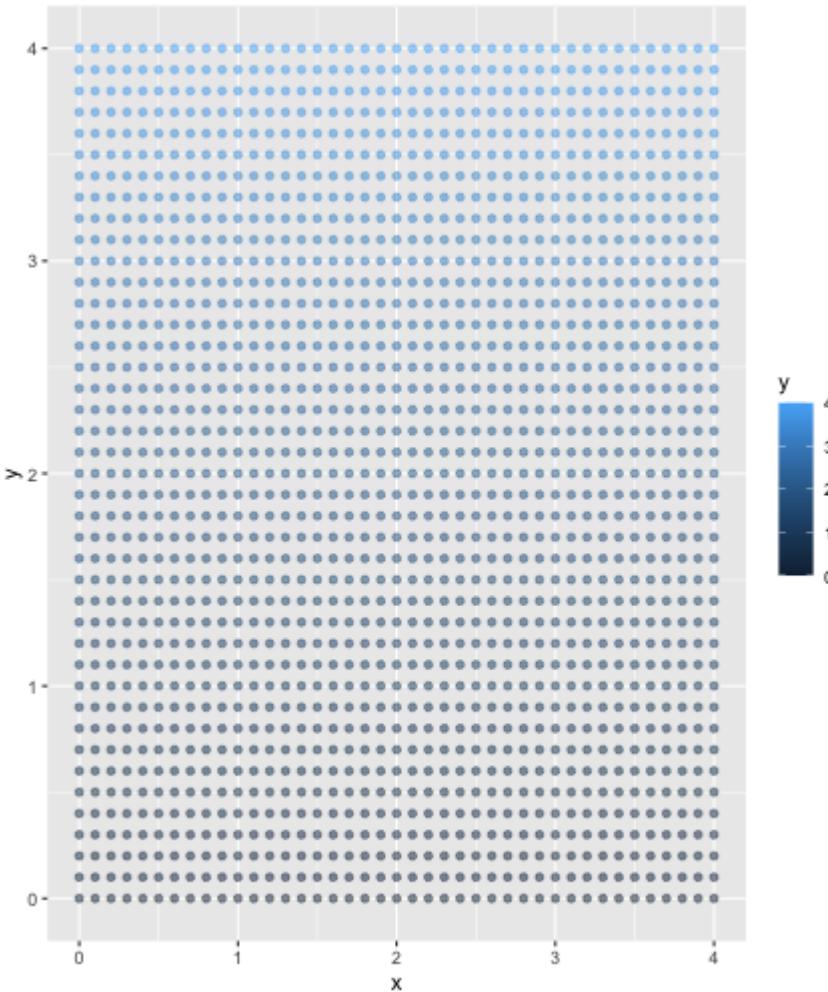
```
seq(0, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
    aes(x = x,  
        y = y)
```



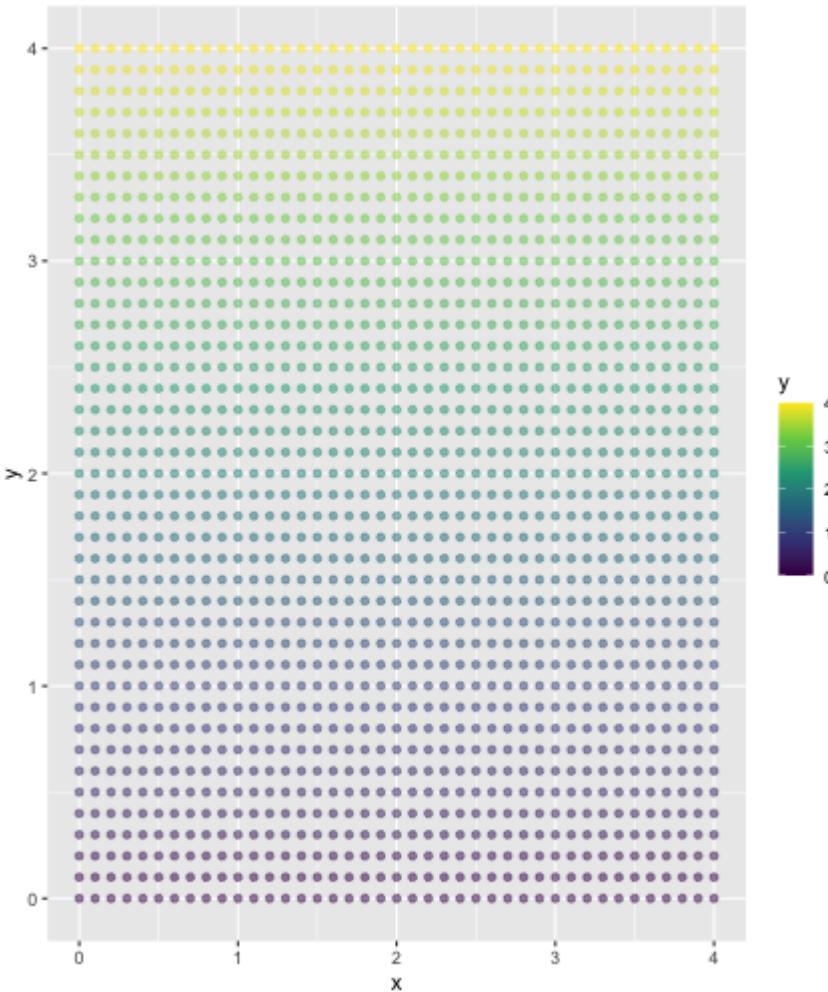
```
seq(0, 4, by = .1) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5)
```



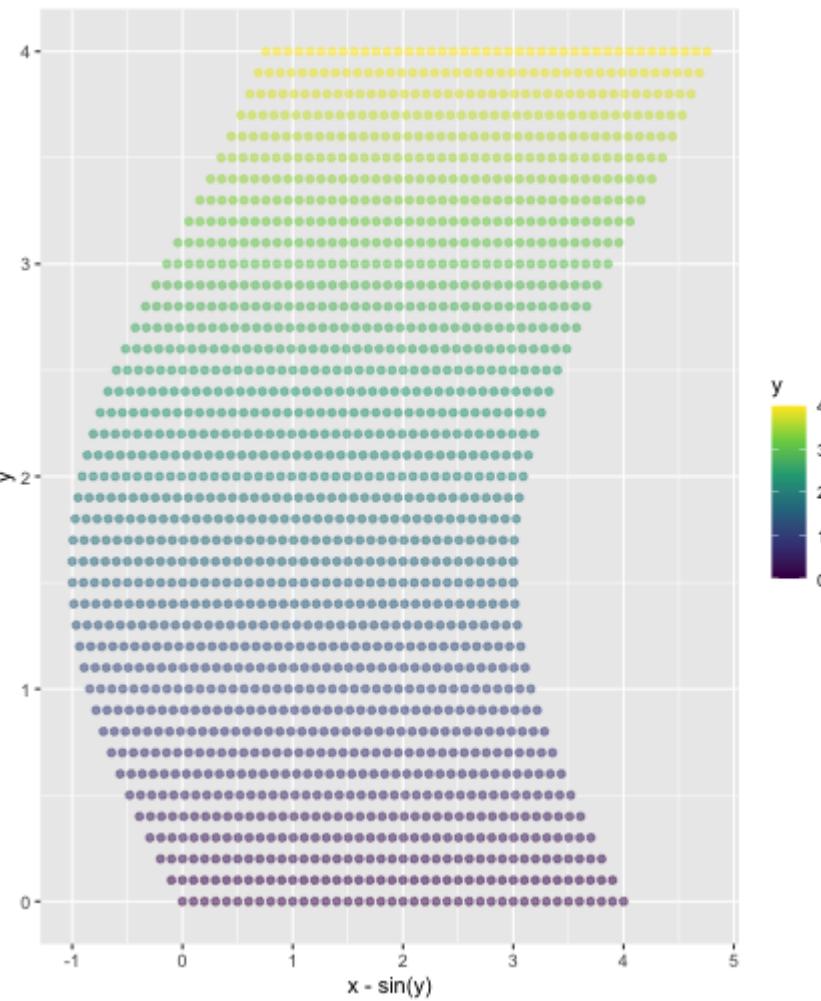
```
seq(0, 4, by = .1) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
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  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5) +  
  aes(color = y)
```



```
seq(0, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x,  
y = y) +  
geom_point(alpha = .5) +  
aes(color = y) +  
scale_color_viridis_c()
```



```
seq(0, 4, by = .1) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5) +  
  aes(color = y) +  
  scale_color_viridis_c() +  
  aes(x = x - sin(y))
```

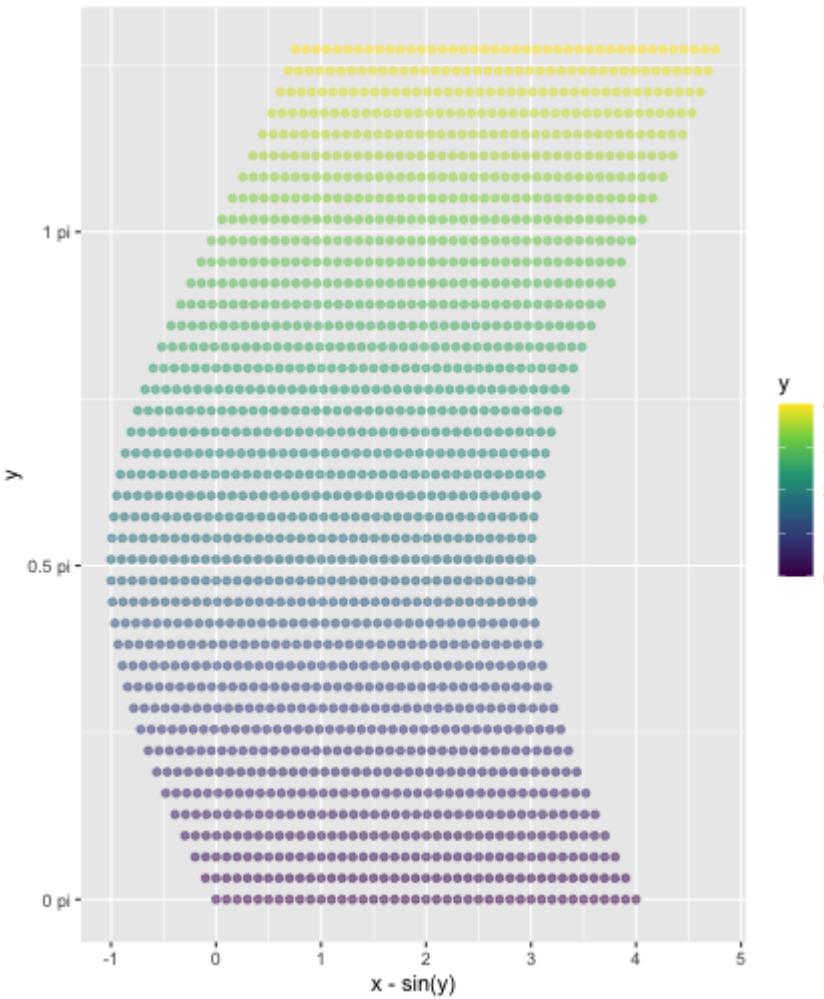


```

seq(0, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(x = x - sin(y)) +
  scale_y_continuous(
    breaks = -2:2/2*pi,
    labels = paste(-2:2/2, "pi")
  )

```

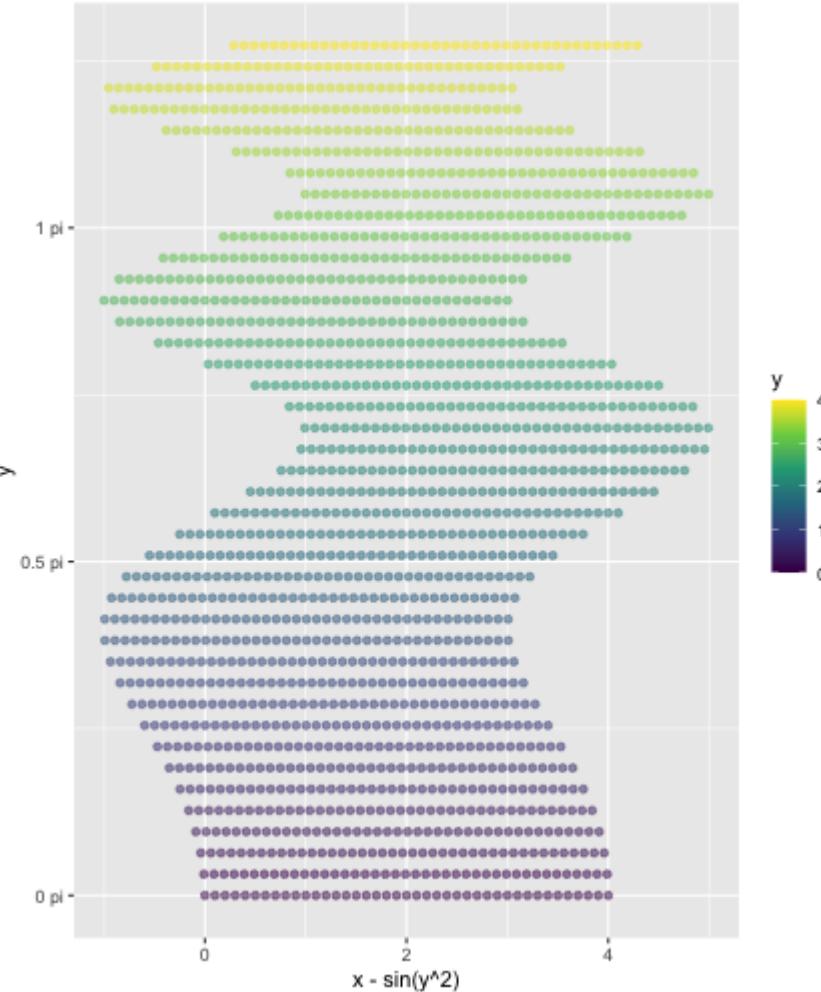


```

seq(0, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(x = x - sin(y)) +
  scale_y_continuous(
    breaks = -2:2/2*pi,
    labels = paste(-2:2/2, "pi")
  ) +
# where waves are accelerating
  aes(x = x - sin(y^2))

```

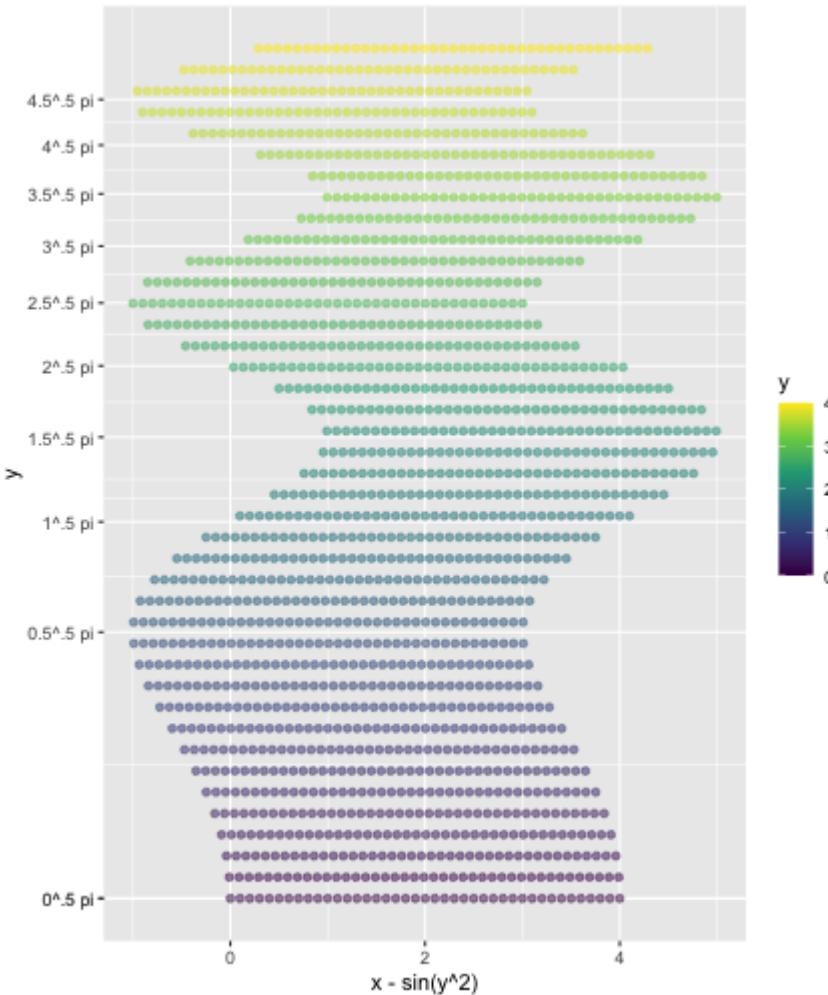


```

seq(0, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(x = x - sin(y)) +
  scale_y_continuous(
    breaks = -2:2/2*pi,
    labels = paste(-2:2/2, "pi")
  ) +
# where waves are accelerating
  aes(x = x - sin(y^2)) +
  scale_y_continuous(breaks = c((0:9/2*pi)^.5,
                                labels = paste0(c((0:9/2)

```

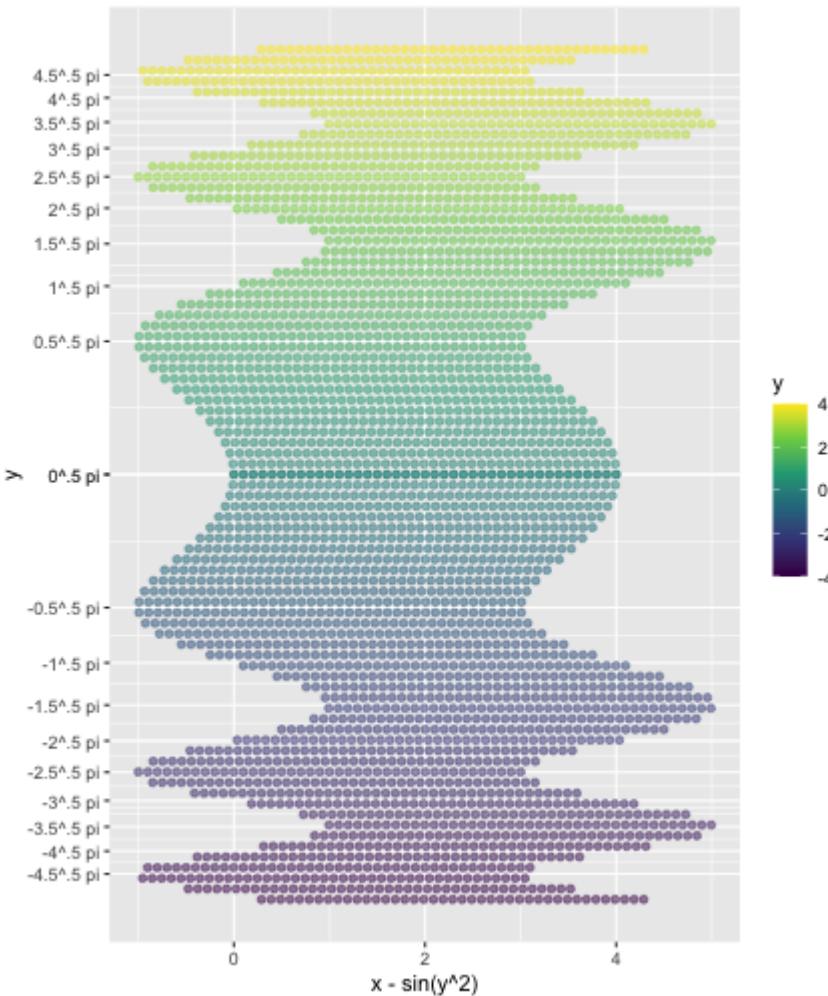


```

seq(0, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(x = x - sin(y)) +
  scale_y_continuous(
    breaks = -2:2/2*pi,
    labels = paste(-2:2/2, "pi")
  ) +
# where waves are accelerating
  aes(x = x - sin(y^2)) +
  scale_y_continuous(breaks = c((0:9/2*pi)^.5,
                                labels = paste0(c((0:9/2
# and reflected over y = 0
  geom_point(
    data = . %>% mutate(y = -y),
    alpha = .5)

```



```
seq(0, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(x = x - sin(y)) +
  scale_y_continuous(
    breaks = -2:2/2*pi,
    labels = paste(-2:2/2, "pi")
  ) +
# where waves are accelerating
  aes(x = x - sin(y^2)) +
  scale_y_continuous(breaks = c((0:9/2*pi)^.5,
                                labels = paste0(c((0:9/2)
# and reflected over y = 0
  geom_point(
    data = . %>% mutate(y = -y),
    alpha = .5) ->
  x_offset_determined_by_y
```

# Now the y position.

## **the y grid position is offset ...**

- into a wave based on the cosine of x

# Now the y position.

**the y grid position is offset ...**

- into a wave based on the cosine of x
- and the waves accelerate moving away from  $x = 0$  (so we actually use  $x^2$ )

# Now the y position.

**the y grid position is offset ...**

- into a wave based on the cosine of x
- and the waves accelerate moving away from  $x = 0$  (so we actually use  $x^2$ )
- and the pattern is reflected across  $x = 0$

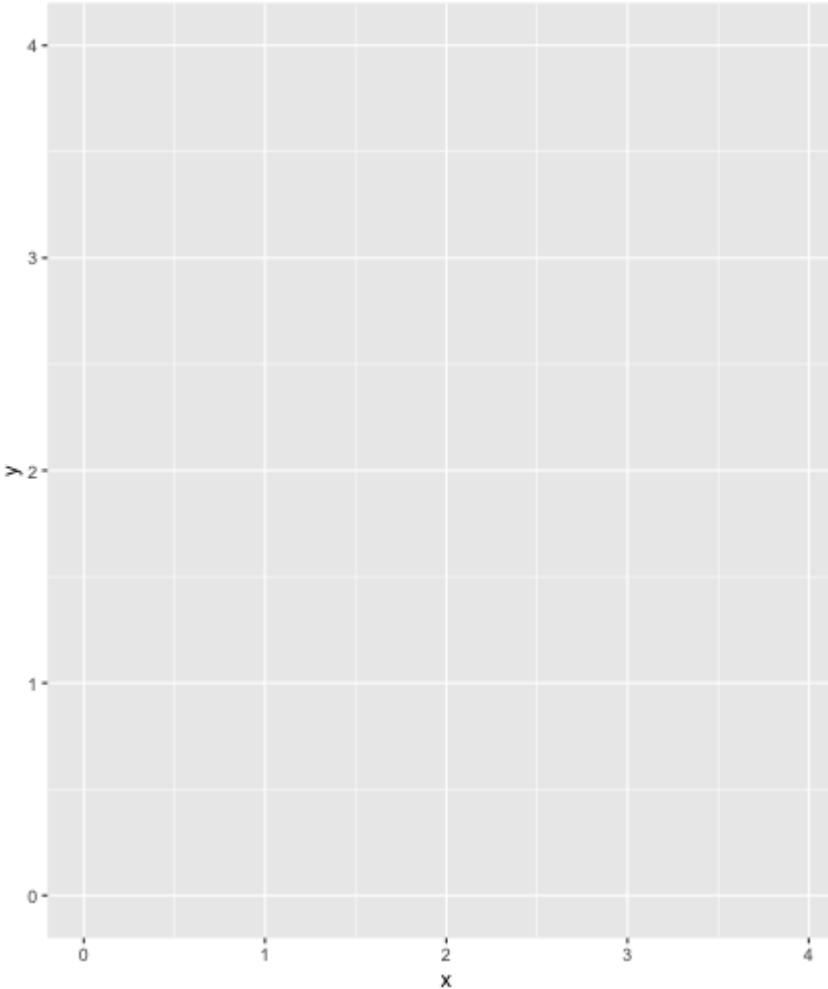


```
tibble(x = my_seq) %>%  
  crossing(y = my_seq)
```

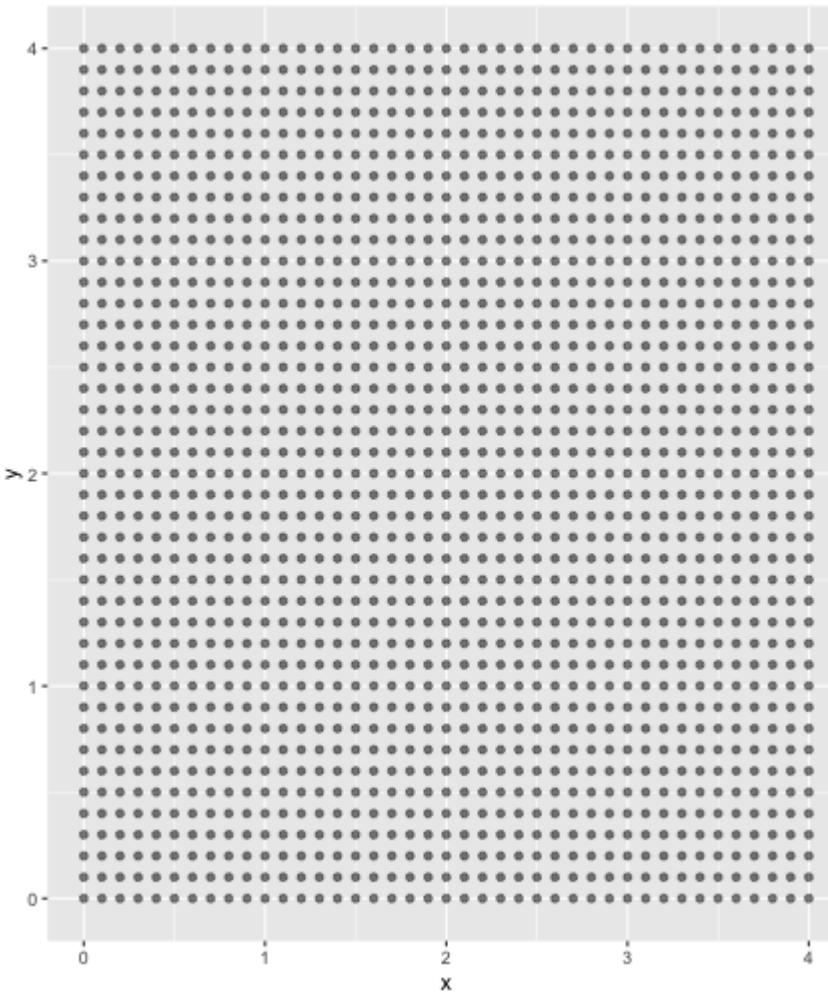
	x	y
	<dbl>	<dbl>
1	0	0
2	0	0.1
3	0	0.2
4	0	0.3
5	0	0.4
6	0	0.5
7	0	0.6
8	0	0.7
9	0	0.8
10	0	0.9
	# ... with 1,671 more rows	

```
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot()
```

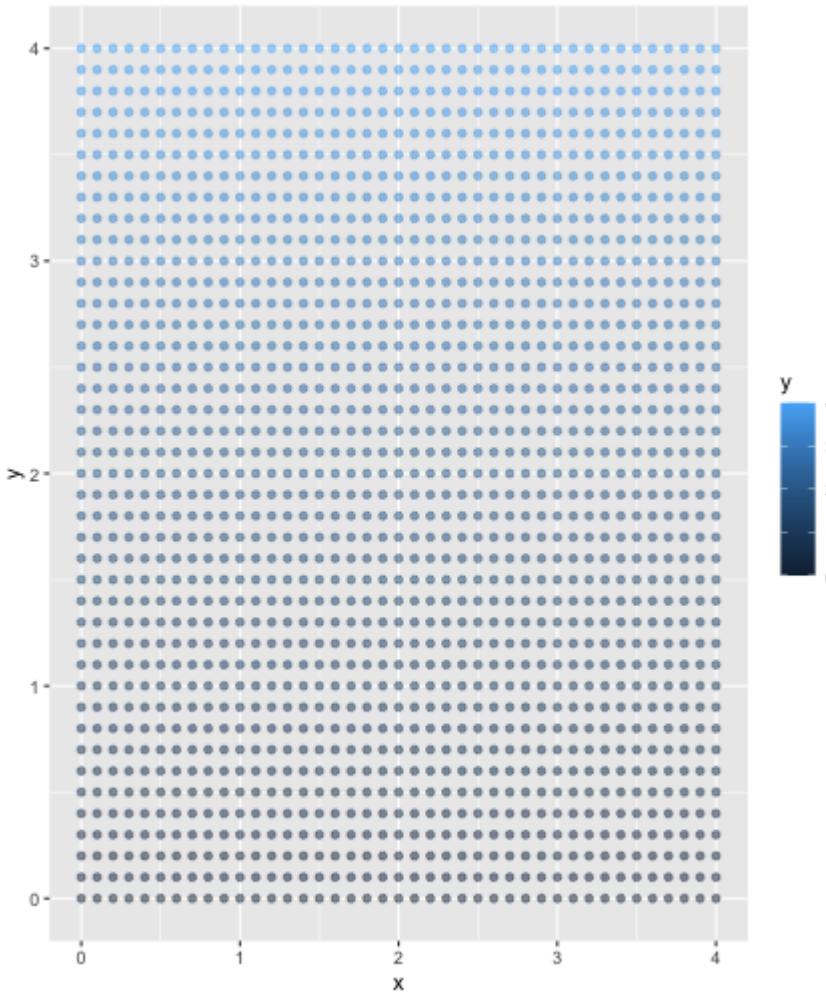
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tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
    aes(x = x,  
        y = y)
```



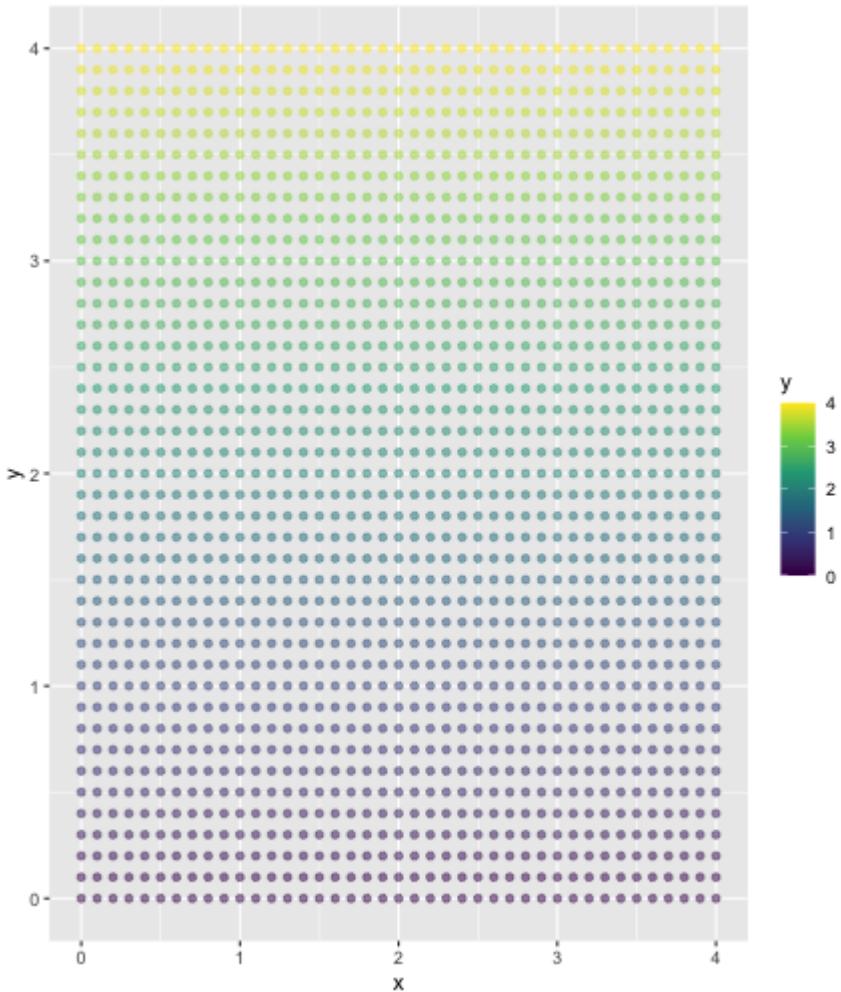
```
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5)
```



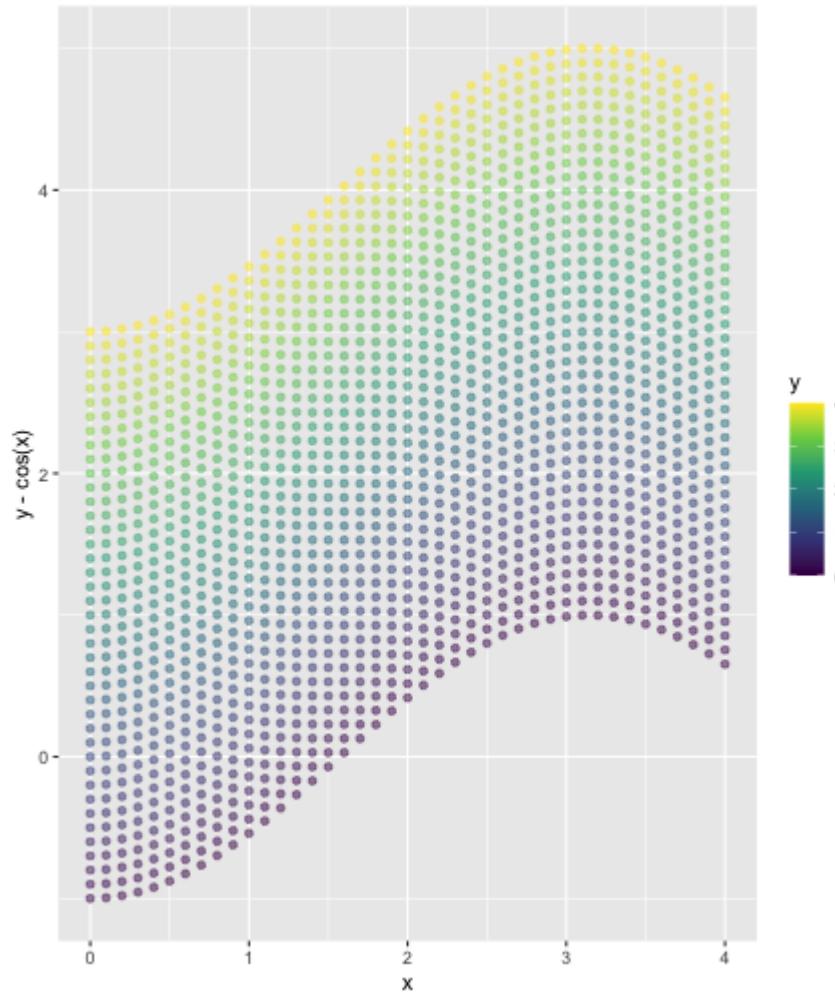
```
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5) +  
  aes(color = y)
```



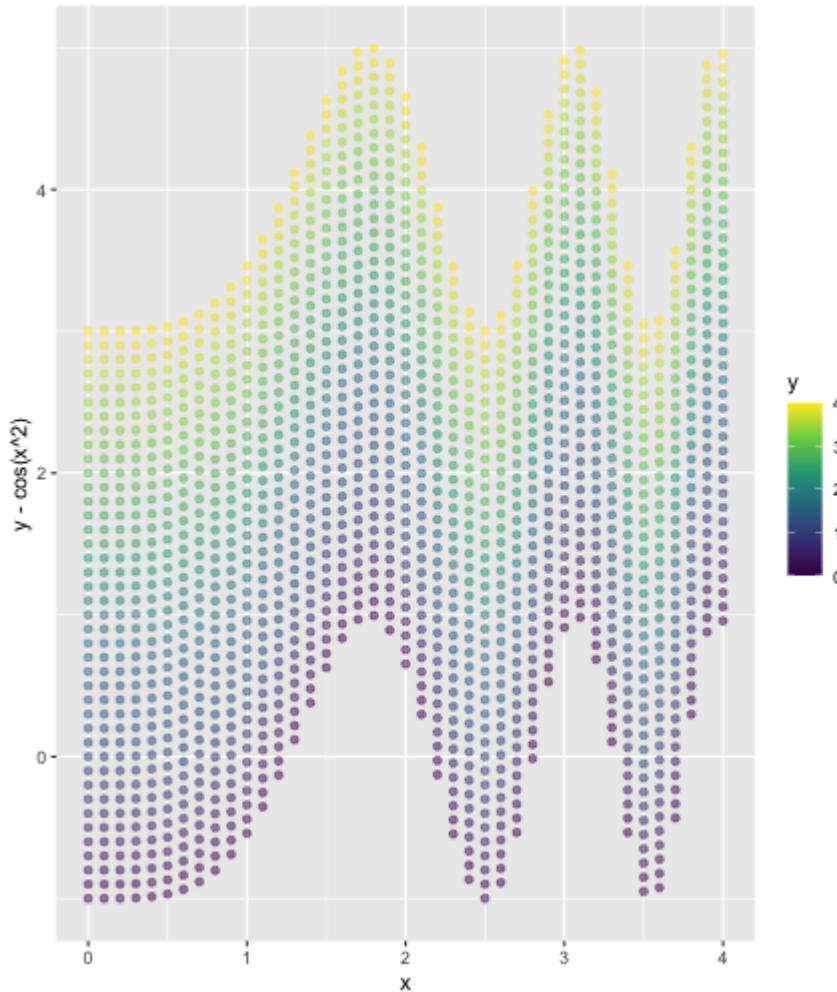
```
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5) +  
  aes(color = y) +  
  scale_color_viridis_c()
```



```
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .5) +  
  aes(color = y) +  
  scale_color_viridis_c() +  
  aes(y = y - cos(x))
```



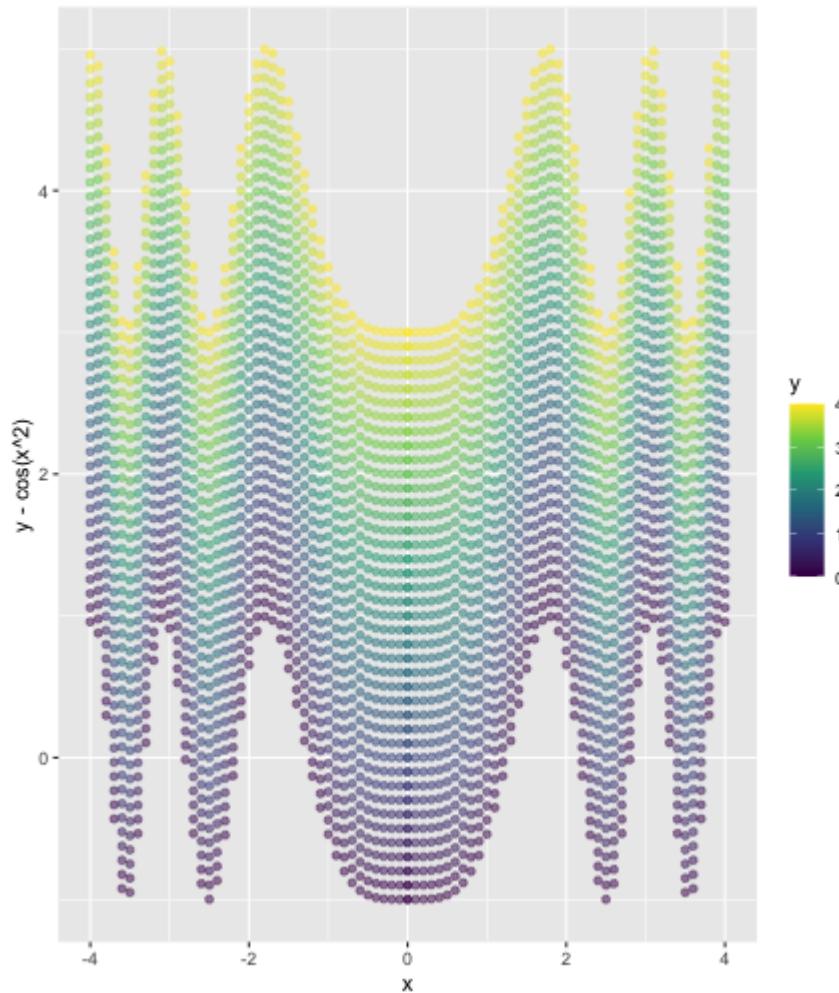
```
tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(y = y - cos(x)) +
# where waves are accelerating
  aes(y = y - cos(x^2))
```



```

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(y = y - cos(x)) +
# where waves are accelerating
  aes(y = y - cos(x^2)) +
# and reflected over y = 0
  geom_point(
    data = . %>% mutate(x = -x),
    alpha = .5)

```



```
tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c() +
  aes(y = y - cos(x)) +
# where waves are accelerating
  aes(y = y - cos(x^2)) +
# and reflected over y = 0
  geom_point(
    data = . %>% mutate(x = -x),
    alpha = .5) ->
y_offset_determined_by_x
```

# putting it all together

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- let's see the evolution of both both sets of offsets...

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- we also let the squaring handle the symmetry across the x and y axes (the sequence goes from -3 to positive 3)

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- let's see the evolution of both both sets of offsets...
- we also let the squaring handle the symmetry across the x and y axes (the sequence goes from -3 to positive 3)

```
seq(-4, 4, by = .1)
```

```
[1] -4.0 -3.9 -3.8 -3.7 -3.6 -3.5 -3.4 -3.3 -3.2 -3.1 -3.0 -2.9 -2.8 -2.7 -2.6  
[16] -2.5 -2.4 -2.3 -2.2 -2.1 -2.0 -1.9 -1.8 -1.7 -1.6 -1.5 -1.4 -1.3 -1.2 -1.1  
[31] -1.0 -0.9 -0.8 -0.7 -0.6 -0.5 -0.4 -0.3 -0.2 -0.1  0.0  0.1  0.2  0.3  0.4  
[46]  0.5  0.6  0.7  0.8  0.9  1.0  1.1  1.2  1.3  1.4  1.5  1.6  1.7  1.8  1.9  
[61]  2.0  2.1  2.2  2.3  2.4  2.5  2.6  2.7  2.8  2.9  3.0  3.1  3.2  3.3  3.4  
[76]  3.5  3.6  3.7  3.8  3.9  4.0
```

```
seq(-4, 4, by = .1) ->  
my_seq
```

```
seq(-4, 4, by = .1) ->  
my_seq  
tibble(x = my_seq)
```

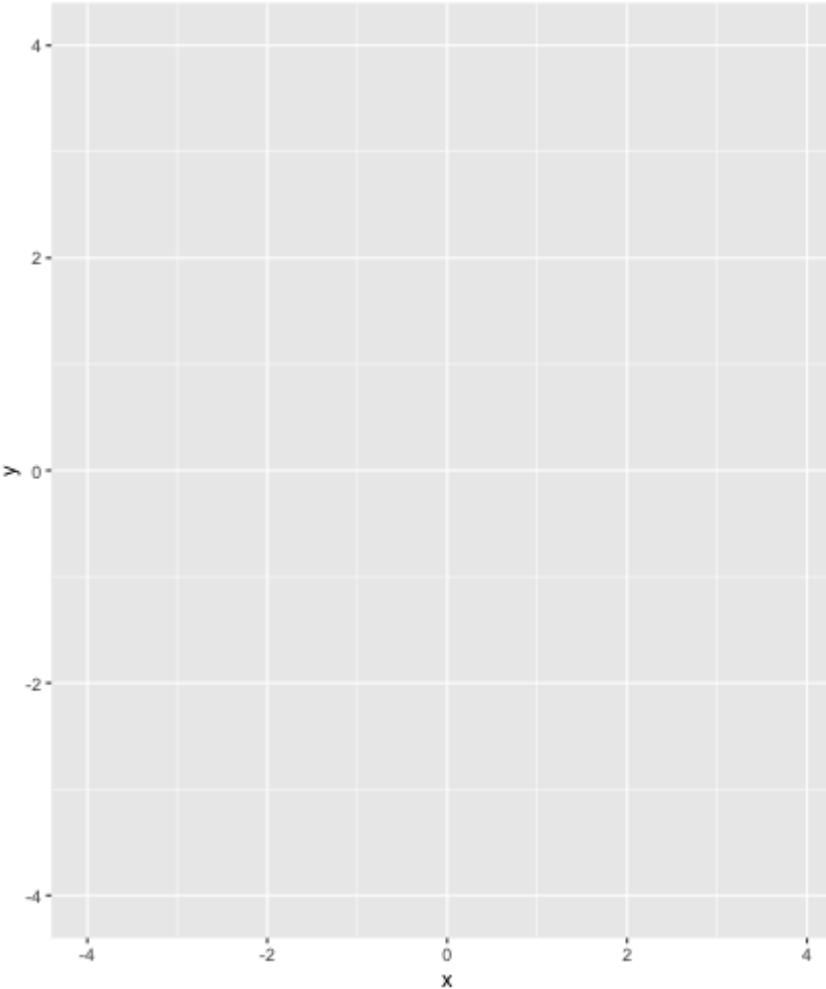
```
# A tibble: 81 x 1  
      x  
   <dbl>  
1   -4  
2  -3.9  
3  -3.8  
4  -3.7  
5  -3.6  
6  -3.5  
7  -3.4  
8  -3.3  
9  -3.2  
10 -3.1  
# ... with 71 more rows
```

```
seq(-4, 4, by = .1) ->  
my_seq  
tibble(x = my_seq) %>%  
crossing(y = my_seq)
```

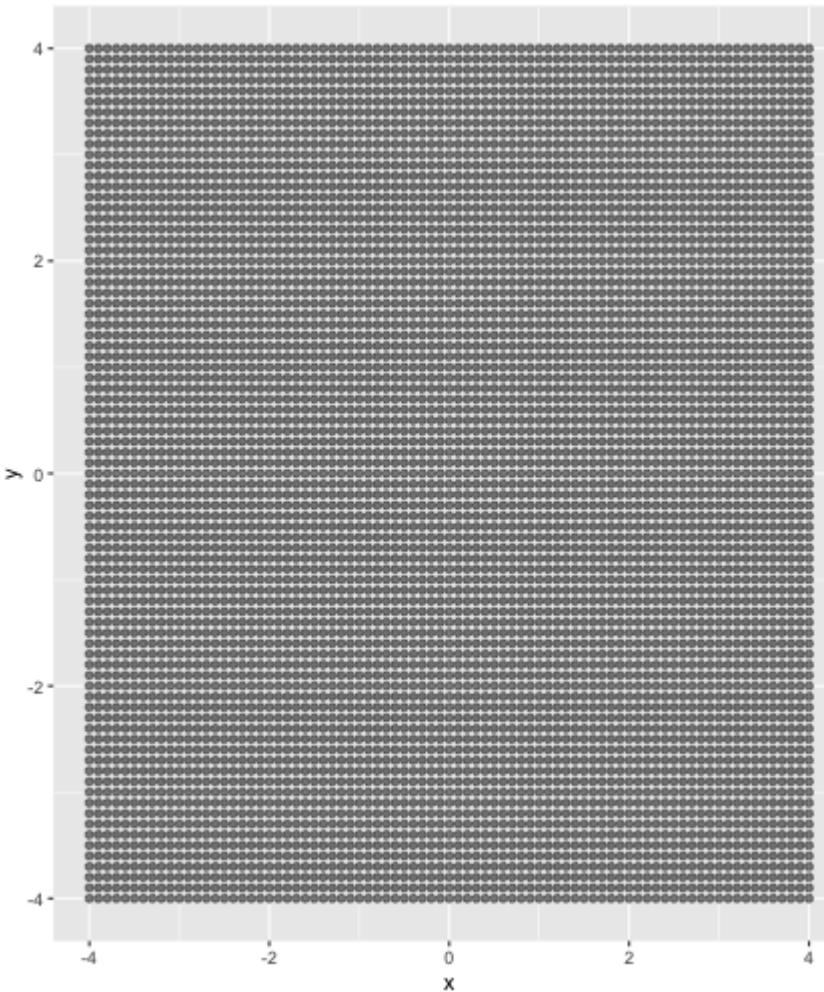
```
# A tibble: 6,561 x 2  
      x     y  
  <dbl> <dbl>  
1    -4    -4  
2    -4   -3.9  
3    -4   -3.8  
4    -4   -3.7  
5    -4   -3.6  
6    -4   -3.5  
7    -4   -3.4  
8    -4   -3.3  
9    -4   -3.2  
10   -4   -3.1  
# ... with 6,551 more rows
```

```
seq(-4, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot()
```

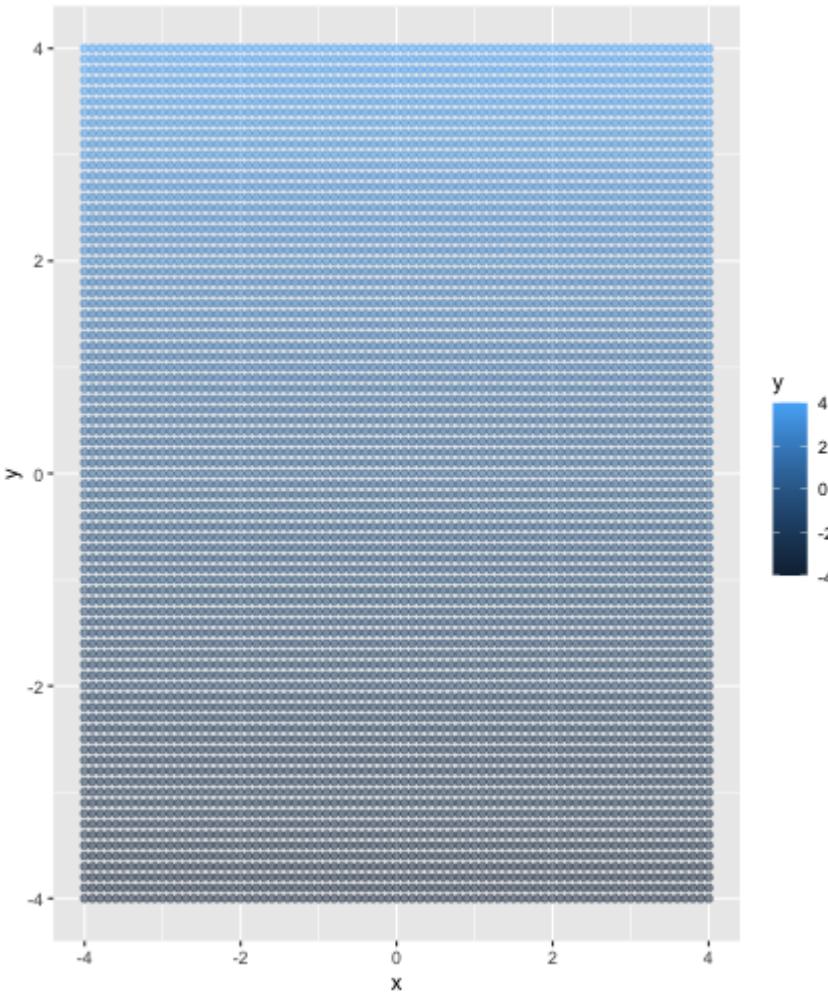
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seq(-4, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
    aes(x = x,  
        y = y)
```



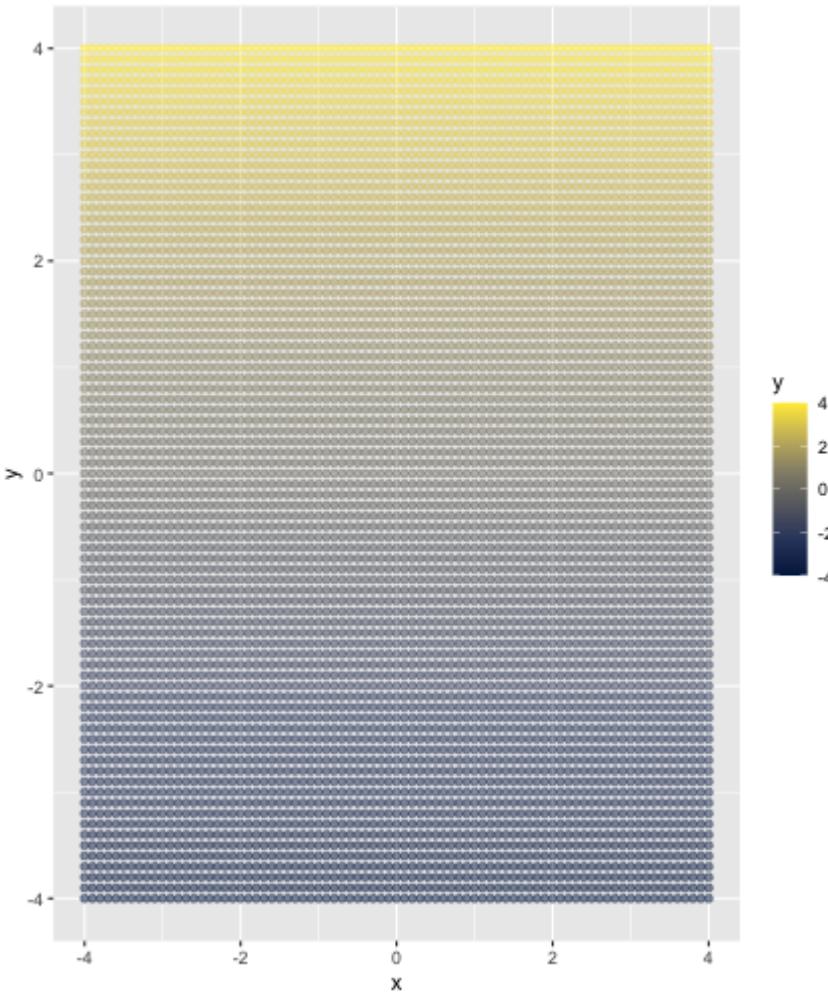
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seq(-4, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x,  
y = y) +  
geom_point(alpha = .5)
```



```
seq(-4, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x,  
y = y) +  
geom_point(alpha = .5) +  
aes(color = y)
```



```
seq(-4, 4, by = .1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x,  
y = y) +  
geom_point(alpha = .5) +  
aes(color = y) +  
scale_color_viridis_c(option = "cividis")
```

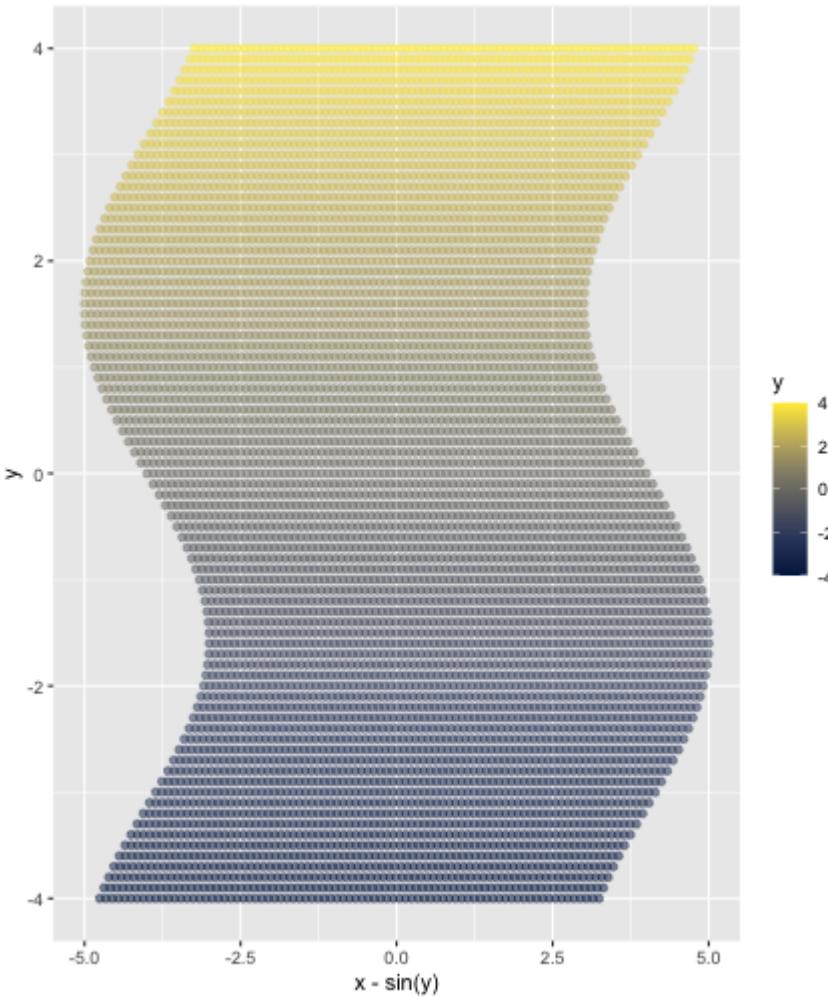


```

seq(-4, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y))

```

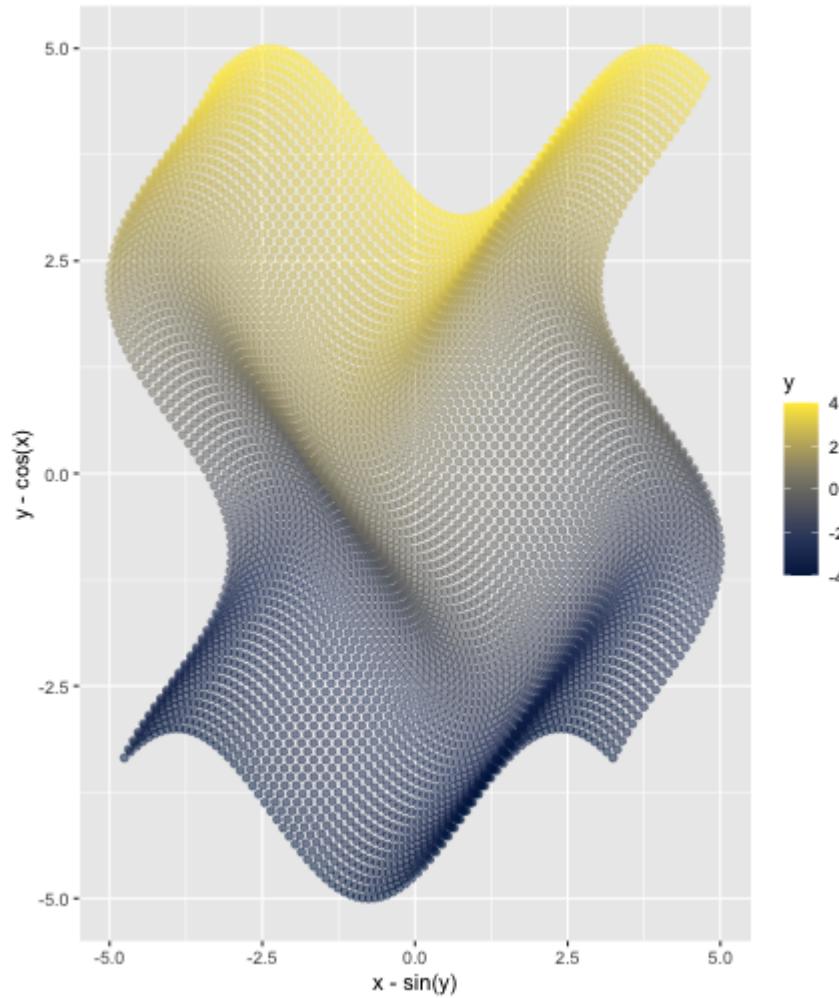


```

seq(-4, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x))

```

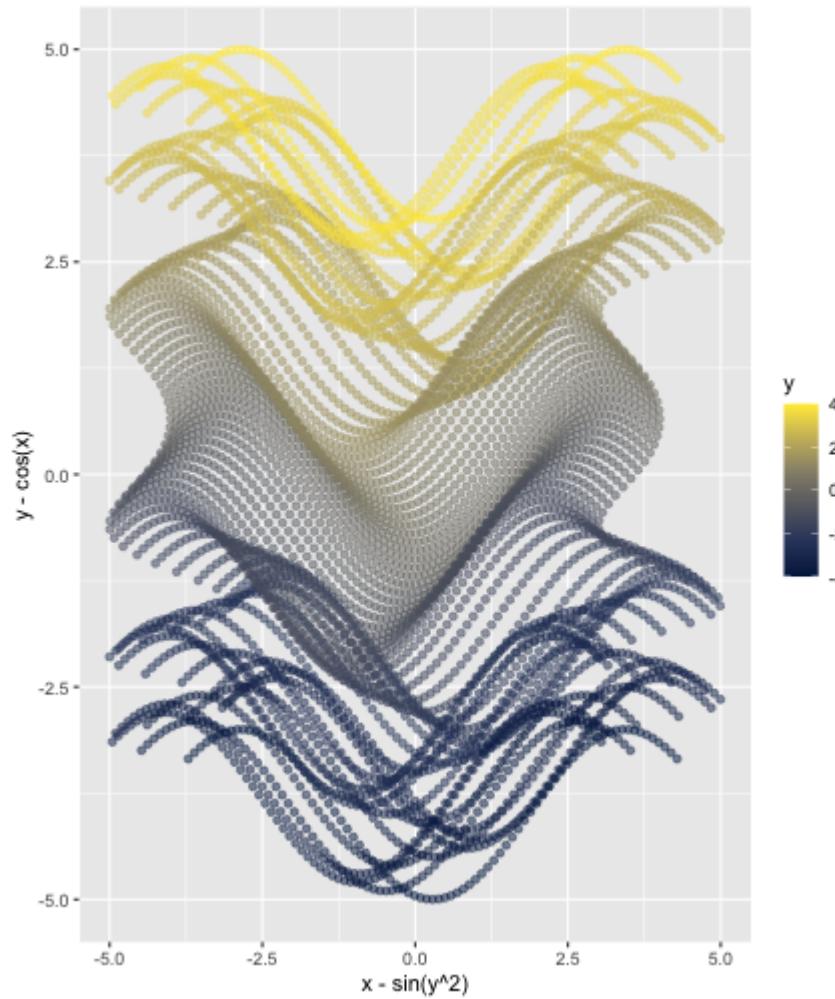


```

seq(-4, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2))

```

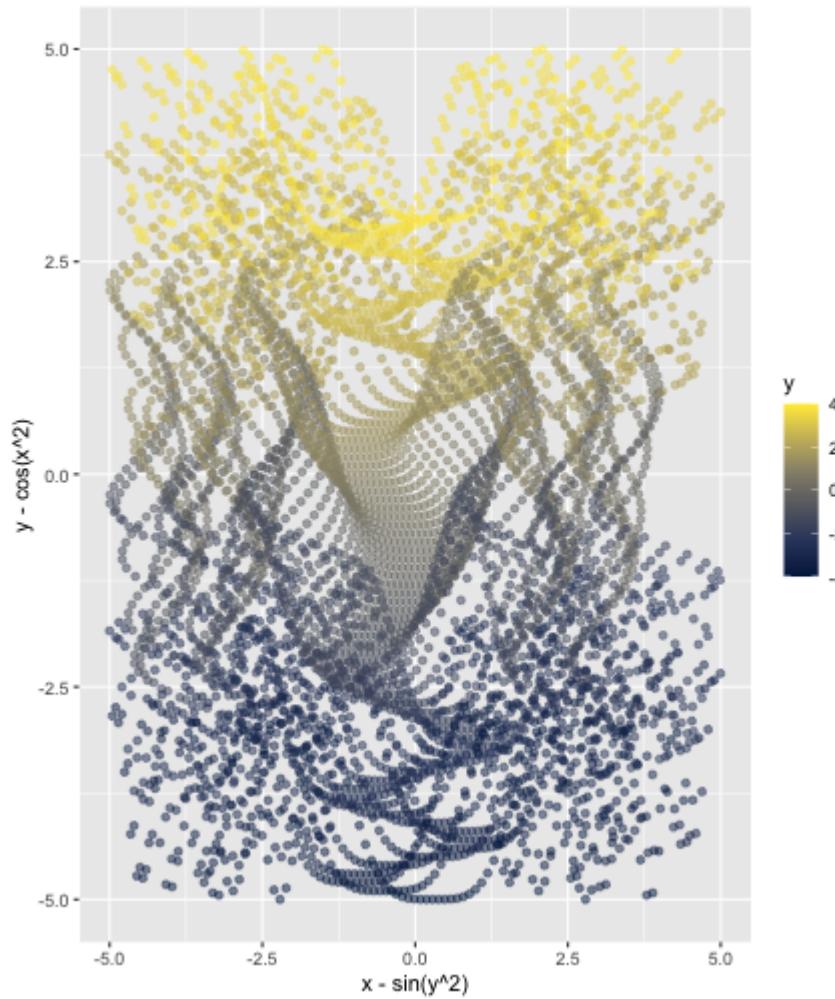


```

seq(-4, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2))

```

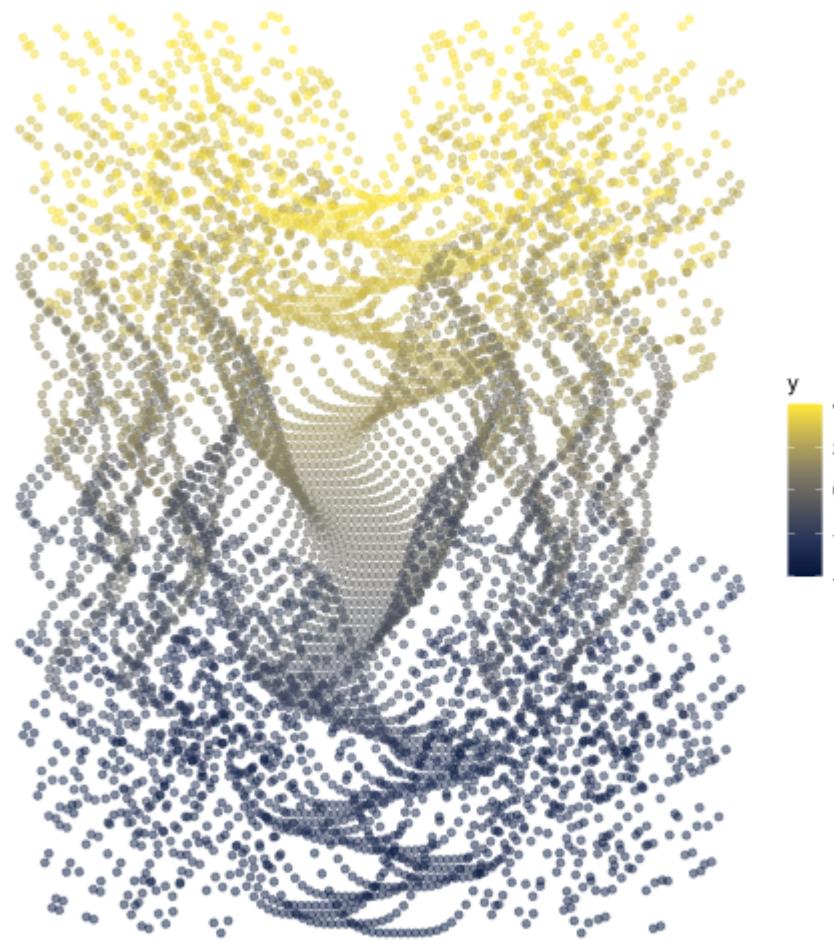


```

seq(-4, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2)) +
  theme_void()

```

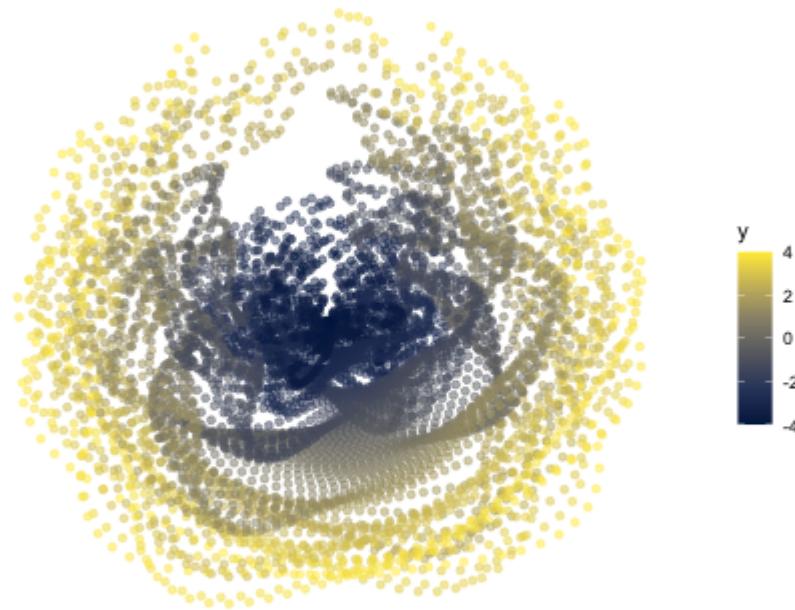


```

seq(-4, 4, by = .1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .5) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar()

```



# Higher resolution is a lot prettier

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- grid points are closer together and smaller

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- patterns are clearer in less dense regions

# Higher resolution is a lot prettier

- grid points are closer together and smaller
- patterns are clearer in less dense regions
- Also, I just do sequence from -3 to 3. This range be more classic, but I though from -4 to 4 showed wave 'acceleration' more clearly.

```
seq(-3, 3, by = .01) -> my_seq
```

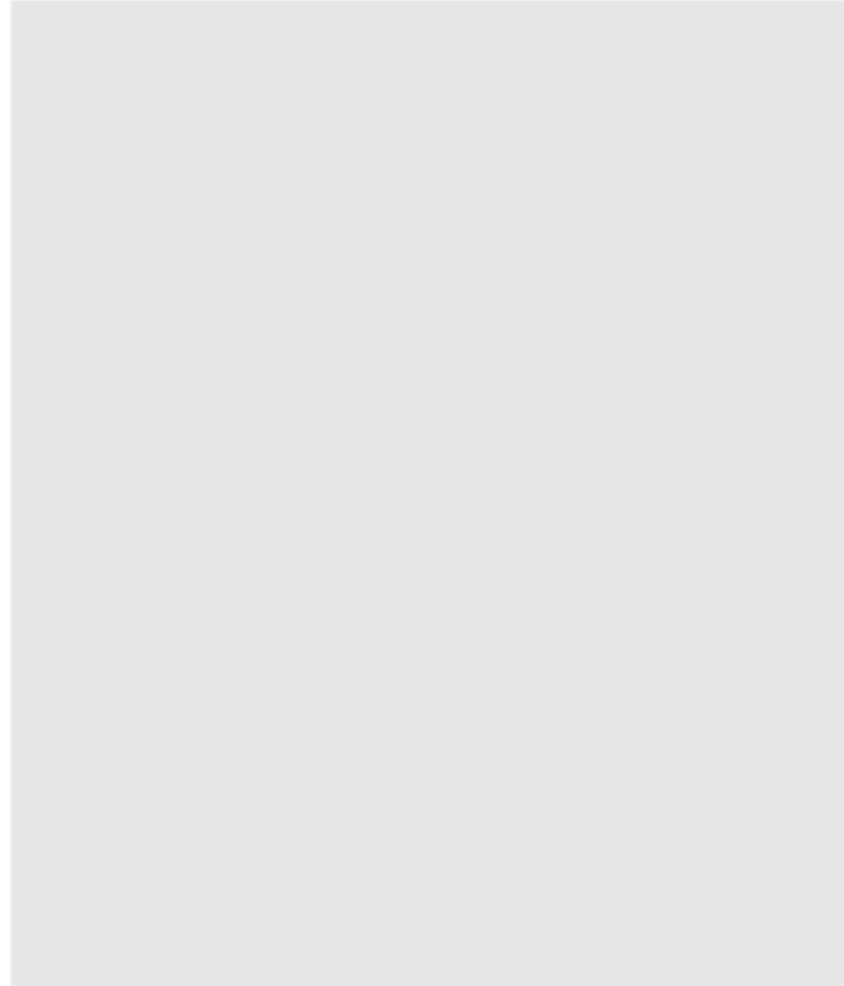
```
seq(-3, 3, by = .01) -> my_seq
tibble(x = my_seq)
```

```
# A tibble: 601 x 1
  x
  <dbl>
1 -3
2 -2.99
3 -2.98
4 -2.97
5 -2.96
6 -2.95
7 -2.94
8 -2.93
9 -2.92
10 -2.91
# ... with 591 more rows
```

```
seq(-3, 3, by = .01) -> my_seq
tibble(x = my_seq) %>%
  crossing(y = my_seq)
```

```
# A tibble: 361,201 x 2
      x     y
  <dbl> <dbl>
1    -3   -3
2    -3  -2.99
3    -3  -2.98
4    -3  -2.97
5    -3  -2.96
6    -3  -2.95
7    -3  -2.94
8    -3  -2.93
9    -3  -2.92
10   -3  -2.91
# ... with 361,191 more rows
```

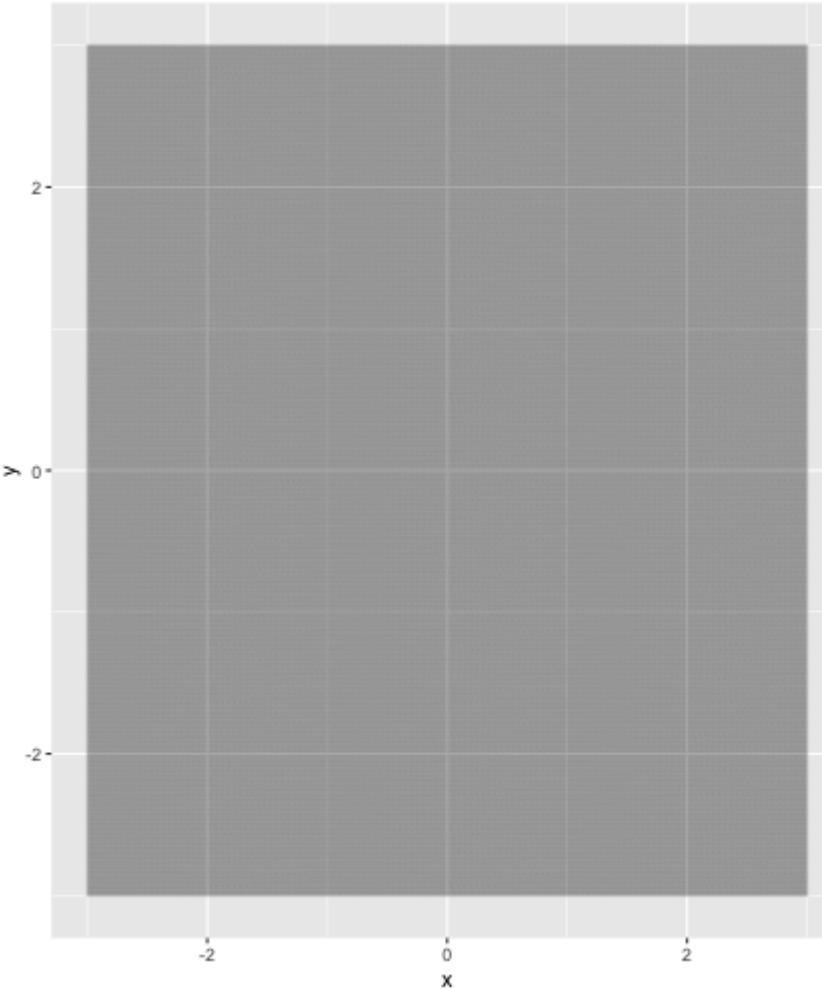
```
seq(-3, 3, by = .01) -> my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot()
```



```
seq(-3, 3, by = .01) -> my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y)
```

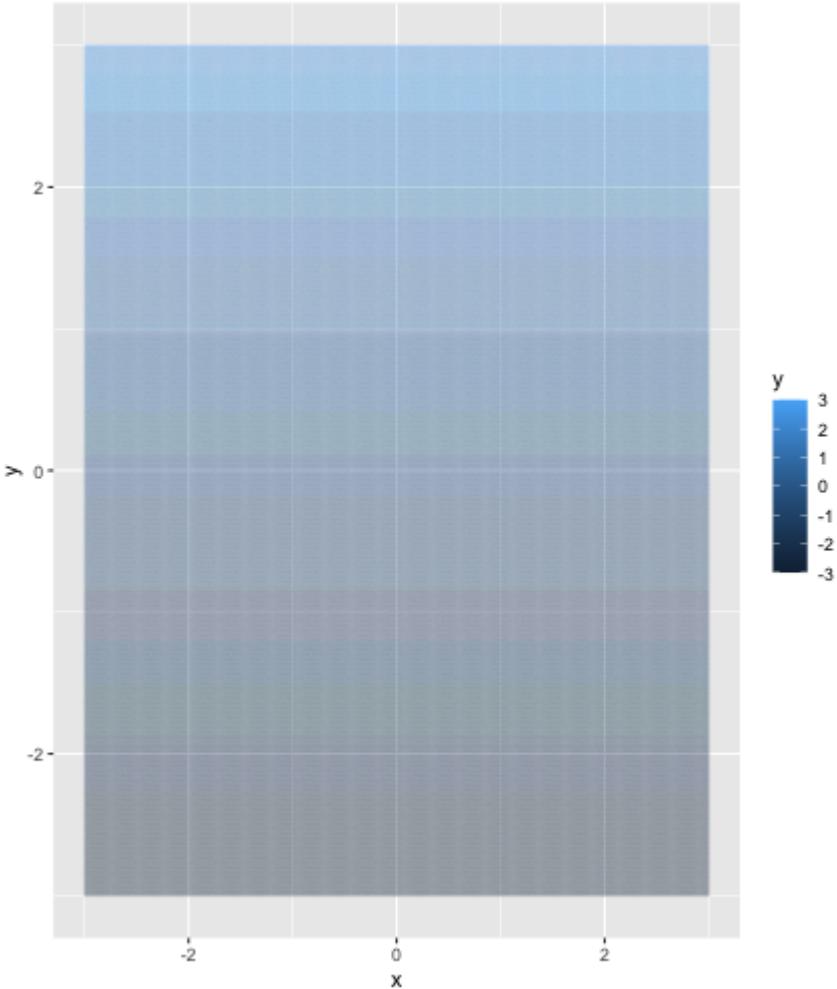


```
seq(-3, 3, by = .01) -> my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x,  
      y = y) +  
  geom_point(alpha = .05, size = .05)
```



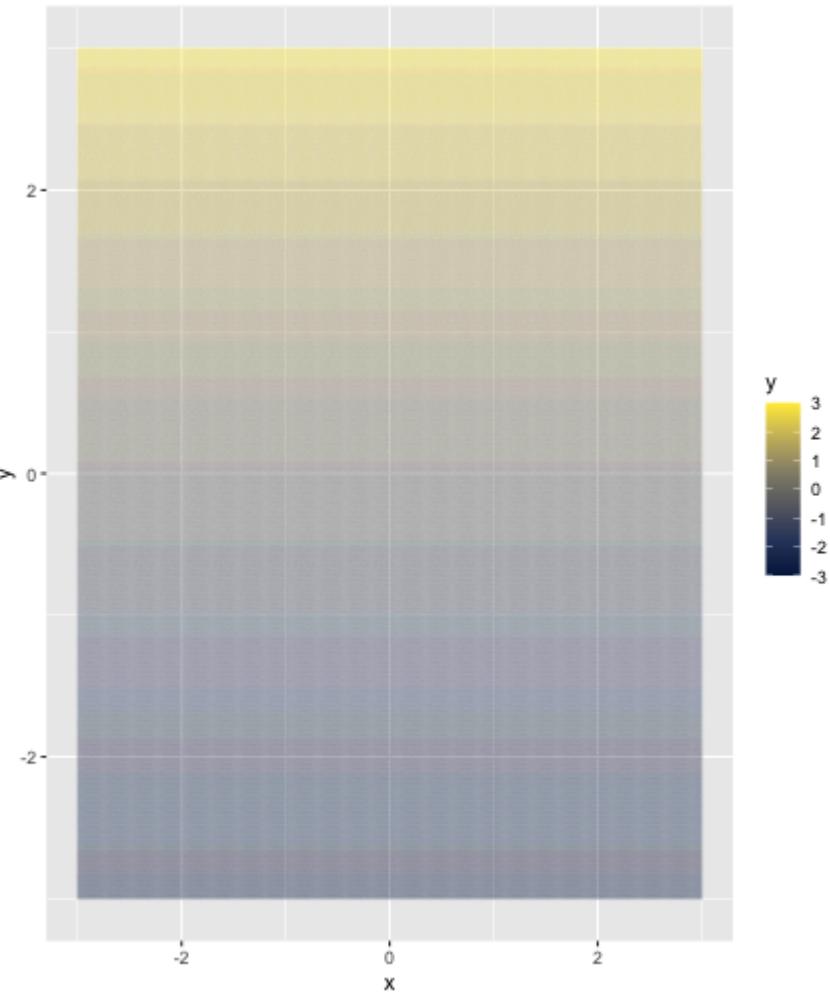
```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y)
```



```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis")
```

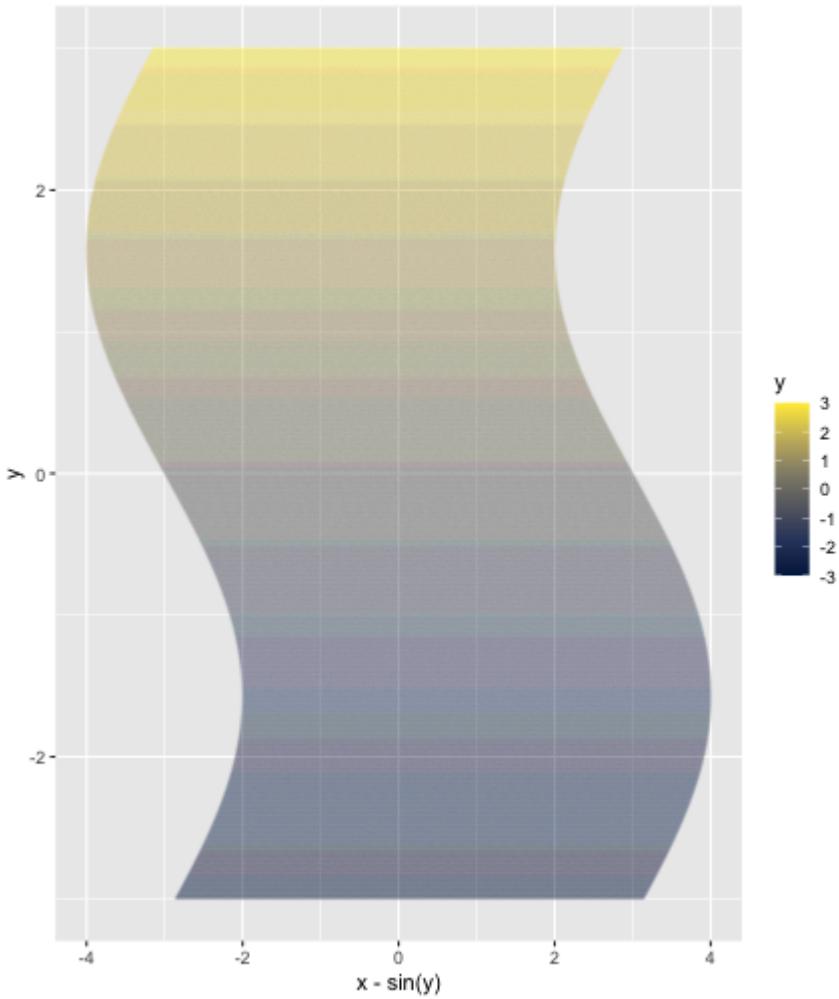


```

seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y))

```

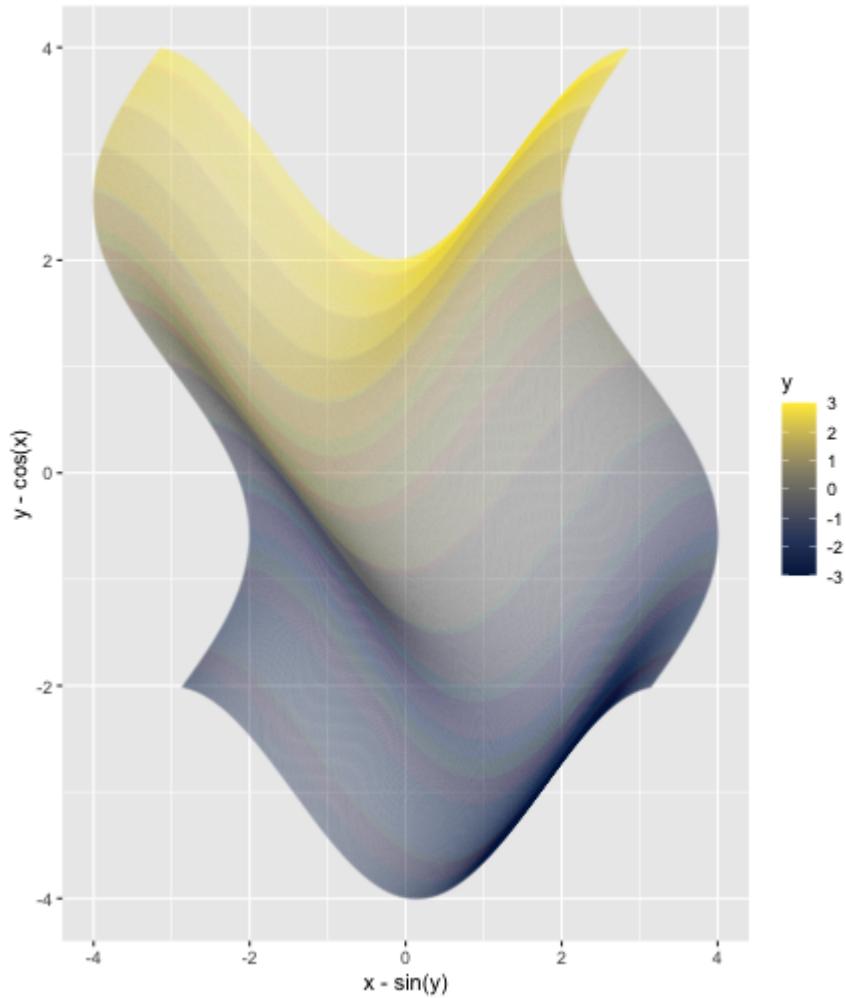


```

seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x))

```

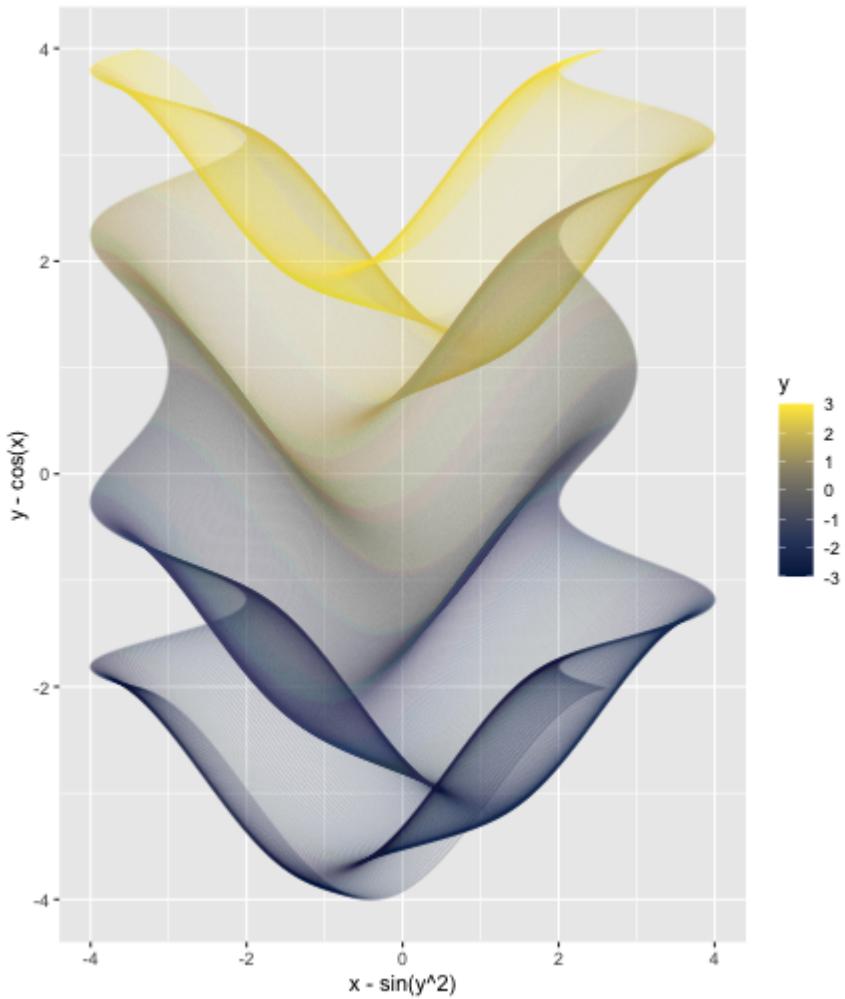


```

seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2))

```

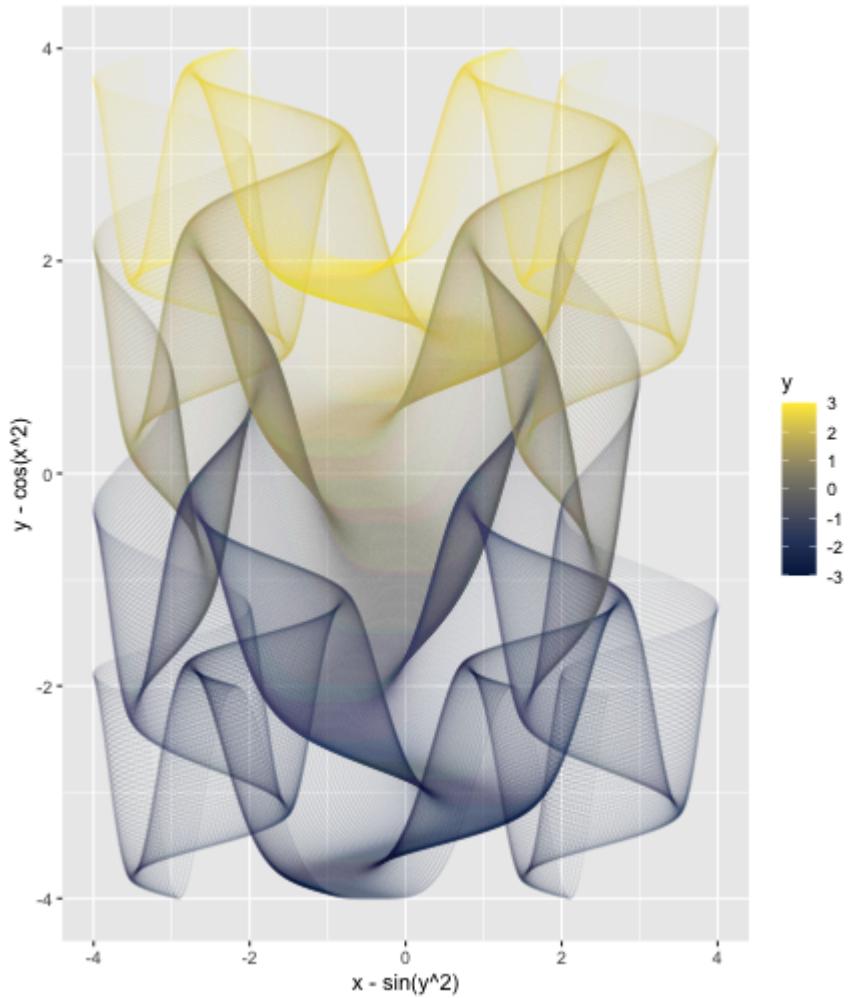


```

seq(-3, 3, by = .01) -> my_seq

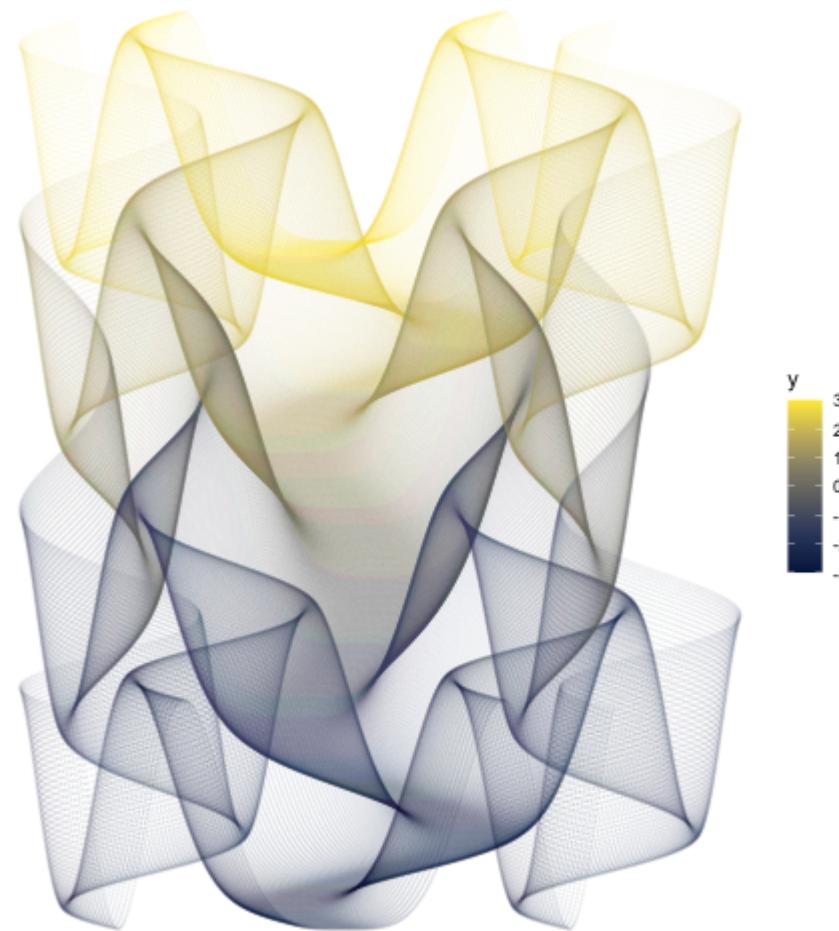
tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2))

```



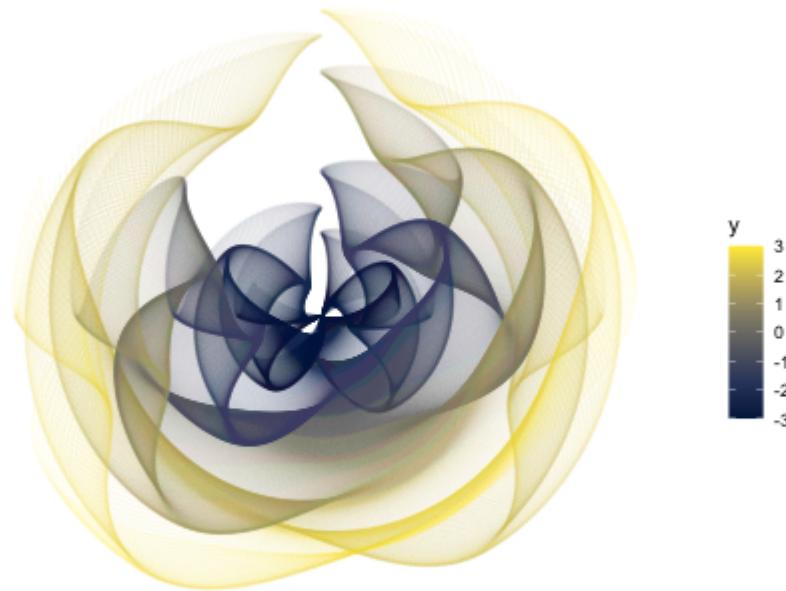
```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2)) +
  theme_void()
```



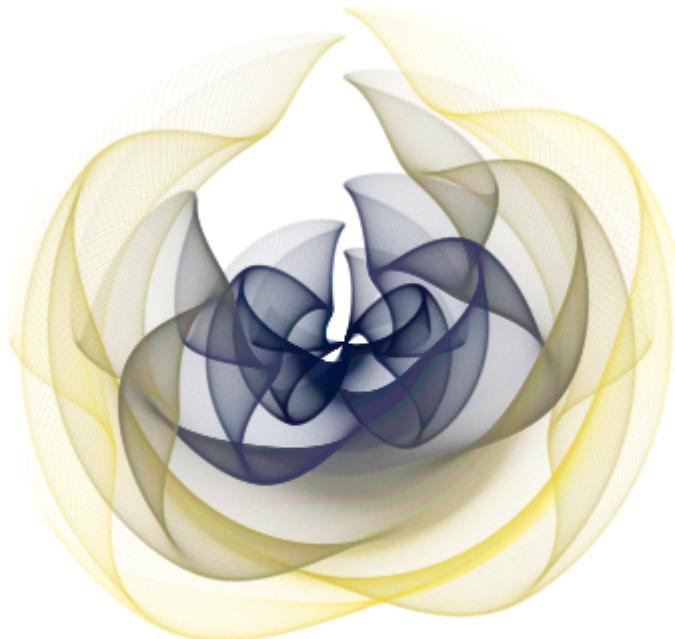
```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar()
```



```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
# offset of x is determined by sin of y
  aes(x = x - sin(y)) +
# offset of y is determined by cos of x
  aes(y = y - cos(x)) +
# and waves are accelerating
# moving away from zero so use squared value
  aes(x = x - sin(y^2)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")
```



Try stuff and see what happens.

Try stuff and see what happens.

We can also look at deceleration of waves away from zero and slower accelerations

**Try stuff and see what happens.**

**We can also look at deceleration of waves away from zero and slower accelerations**

- squaring is a special case that gives us reflection automatically

# Try stuff and see what happens.

## We can also look at deceleration of waves away from zero and slower accelerations

- squaring is a special case that gives us reflection automatically
- we'll get irrational numbers if we raise negative numbers to decimals

# Try stuff and see what happens.

## We can also look at deceleration of waves away from zero and slower accelerations

- squaring is a special case that gives us reflection automatically
- we'll get irrational numbers if we raise negative numbers to decimals
- so we take absolute value first

# Try stuff and see what happens.

## We can also look at deceleration of waves away from zero and slower accelerations

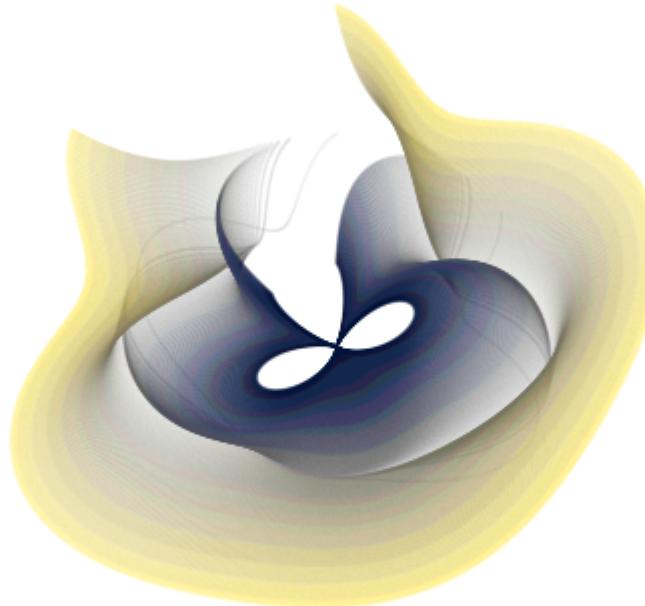
- squaring is a special case that gives us reflection automatically
- we'll get irrational numbers if we raise negative numbers to decimals
- so we take absolute value first
- we'll only adjust the value of x based on the sin of the absolute value of y to some power (between .3 to 1.9)

```

seq(-3, 3, by = .01) -> my_seq

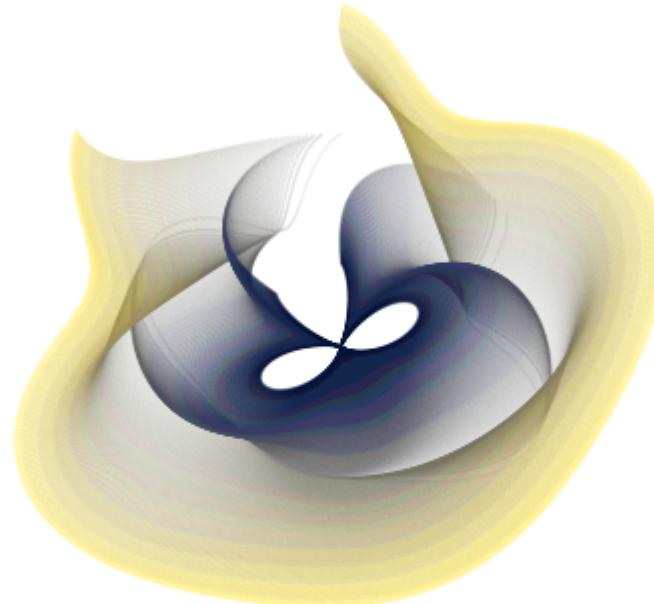
tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^.3)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")

```



```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^.5)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")
```

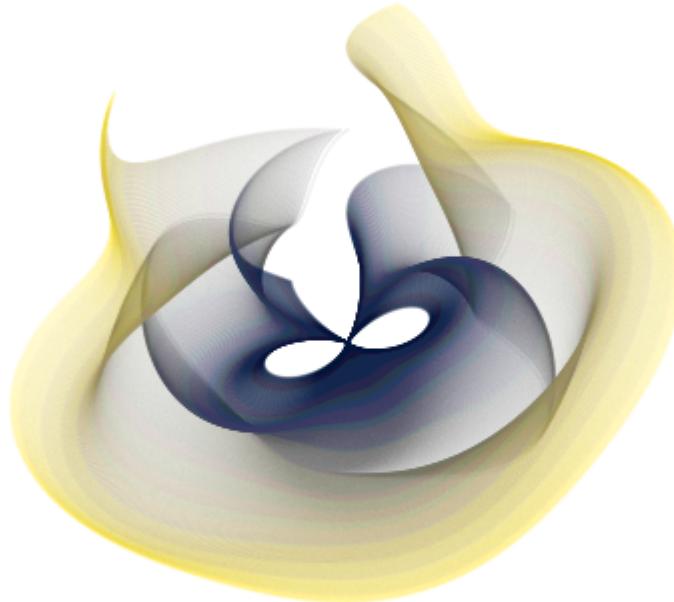


```

seq(-3, 3, by = .01) -> my_seq

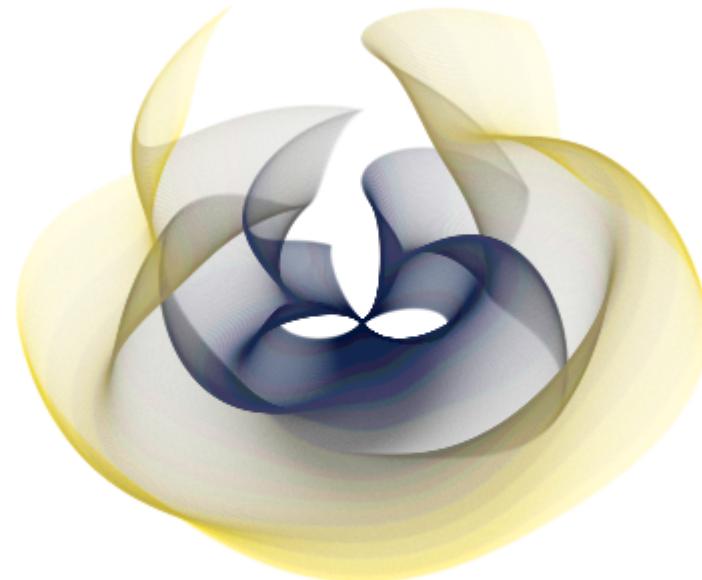
tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^.7)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")

```



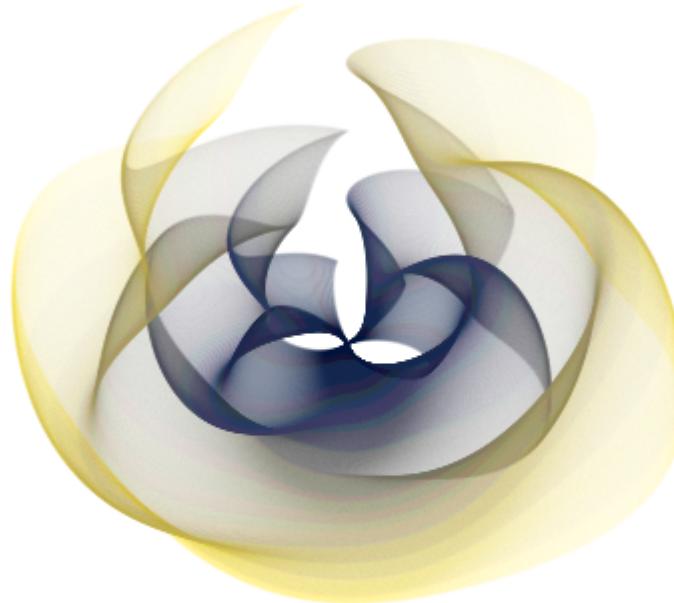
```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^.9)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")
```



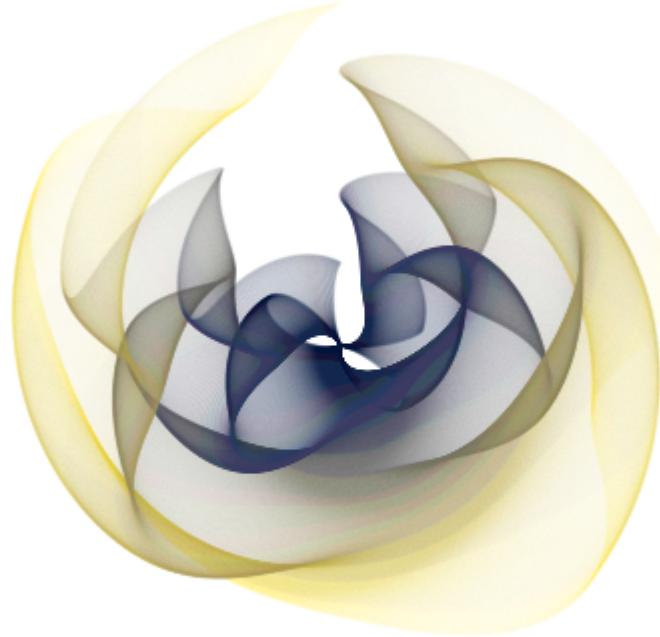
```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^1)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")
```



```
seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^1.25)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")
```

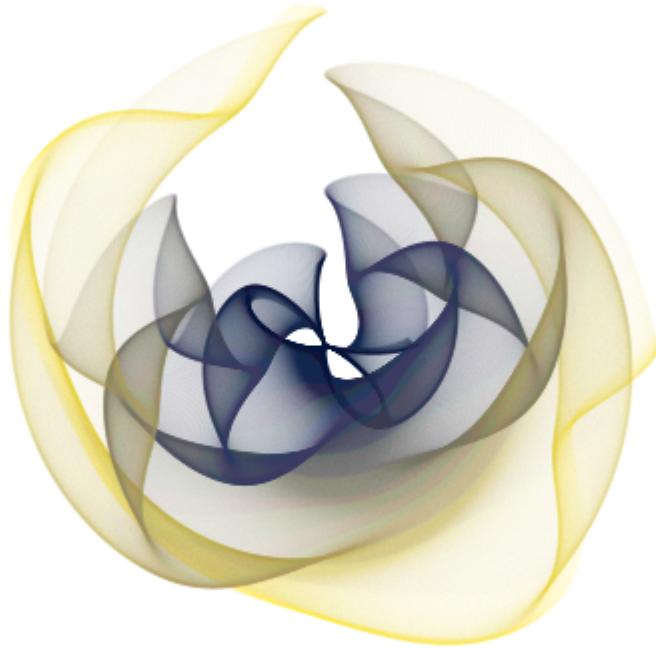


```

seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^1.5)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")

```

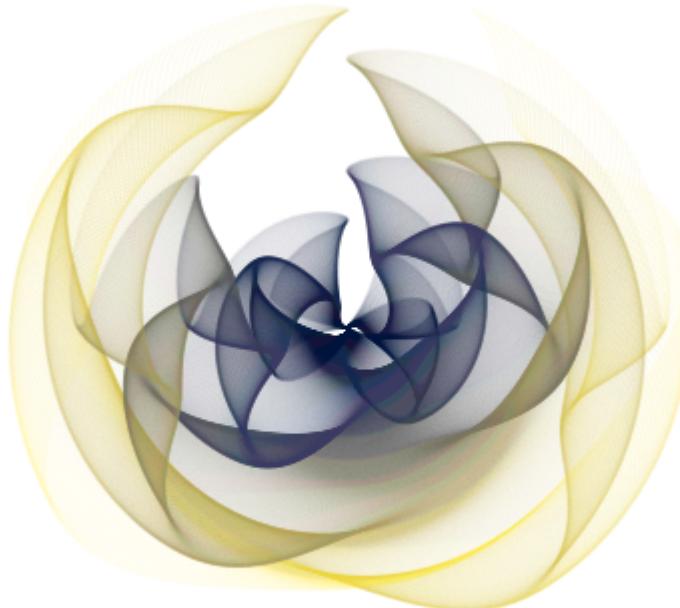


```

seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^1.75)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")

```

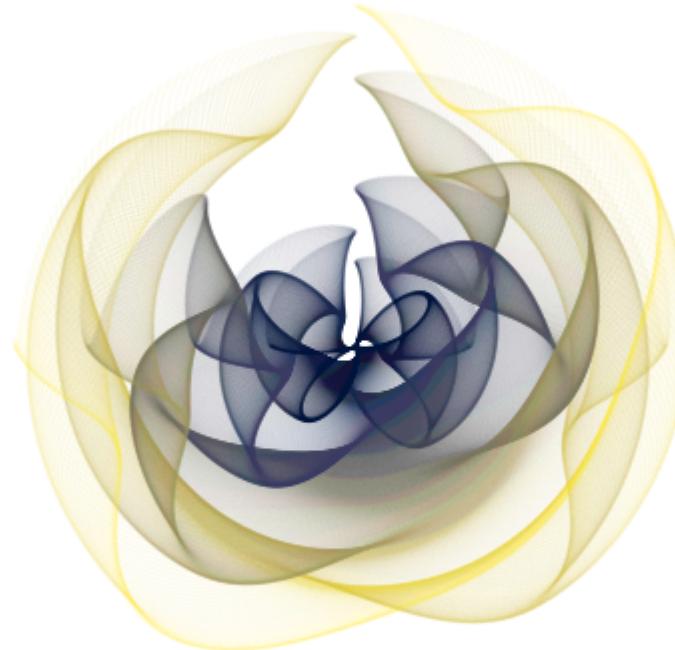


```

seq(-3, 3, by = .01) -> my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x,
      y = y) +
  geom_point(alpha = .05, size = .05) +
  aes(color = y) +
  scale_color_viridis_c(option = "cividis") +
  # offset of x is determined by sin of y
  aes(x = x - sin(y)) +
  # offset of y is determined by cos of x
  aes(y = y - cos(x)) +
  # and waves are accelerating
  # moving away from zero so use squared value
  aes(x = x - sin(abs(y)^1.9)) +
  aes(y = y - cos(x^2)) +
  theme_void() +
  coord_polar() +
  theme(legend.position = "none")

```





stingray



```
seq(0,9, by = 0.1)
```

```
[1] 0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8  
[20] 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7  
[39] 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0 5.1 5.2 5.3 5.4 5.5 5.6  
[58] 5.7 5.8 5.9 6.0 6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9 7.0 7.1 7.2 7.3 7.4 7.5  
[77] 7.6 7.7 7.8 7.9 8.0 8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9 9.0
```

```
seq(0,9, by = 0.1) ->  
my_seq
```

```
seq(0, 9, by = 0.1) ->  
  my_seq  
  
tibble(x = my_seq)
```

# A tibble: 91 x 1

x

<dbl>

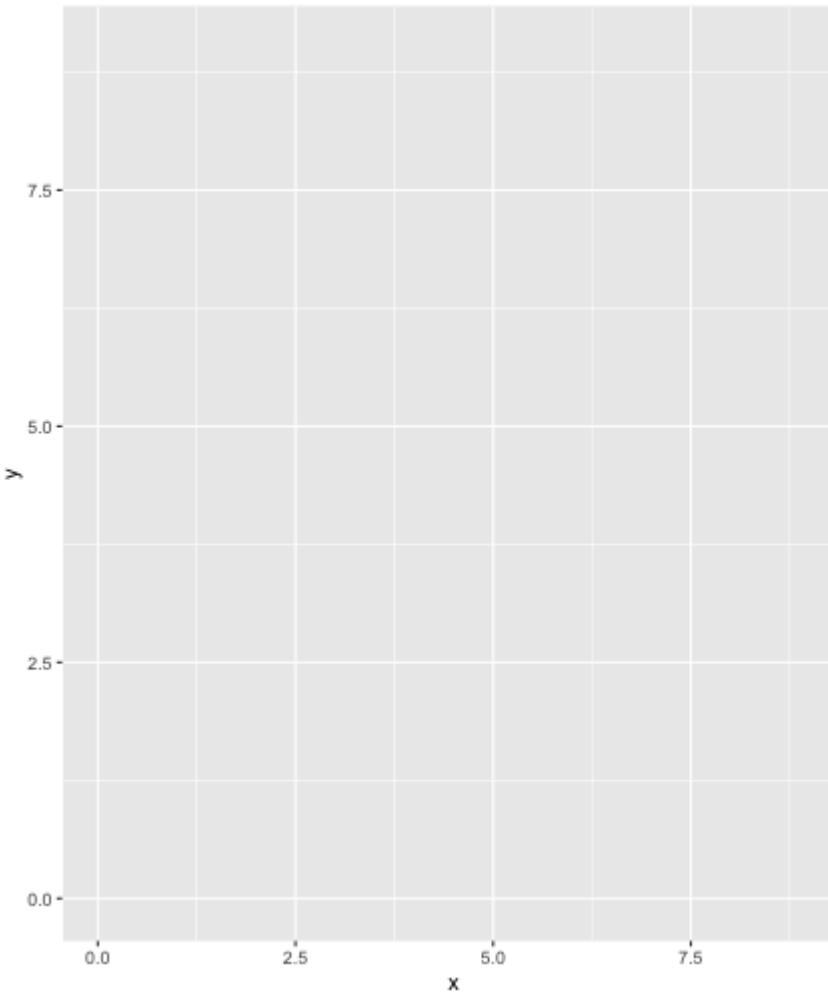
1	0
2	0.1
3	0.2
4	0.3
5	0.4
6	0.5
7	0.6
8	0.7
9	0.8
10	0.9
	# ... with 81 more rows

```
seq(0,9, by = 0.1) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq)
```

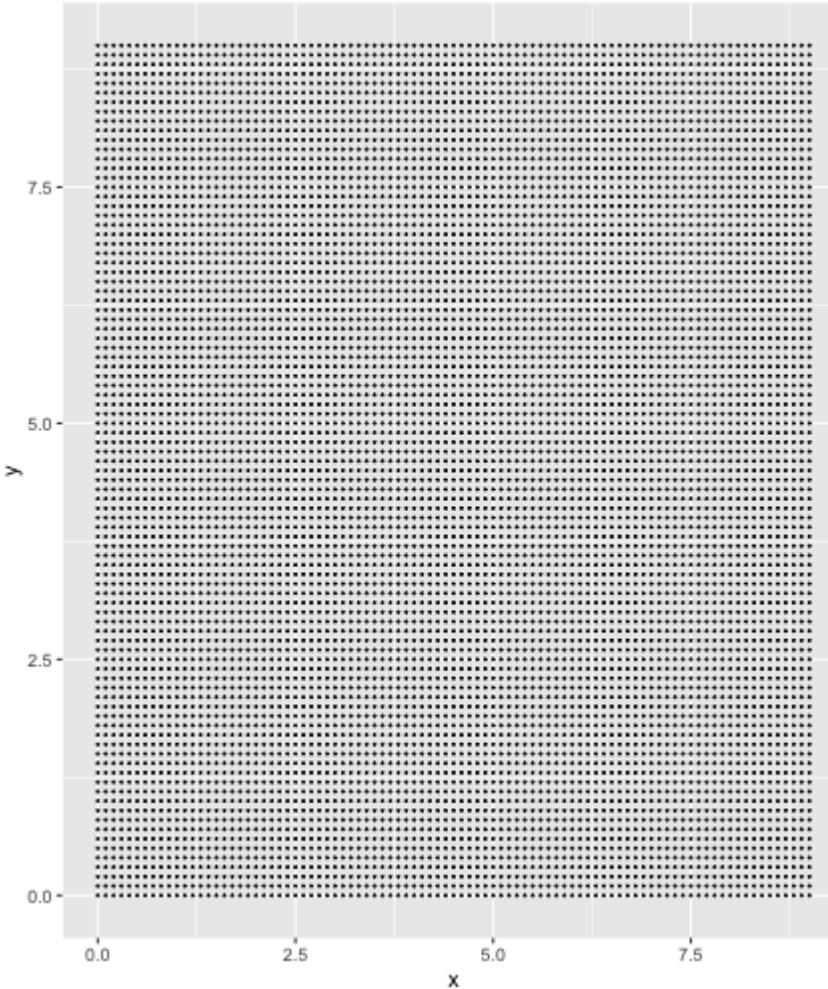
```
# A tibble: 8,281 x 2  
      x     y  
  <dbl> <dbl>  
1     0     0  
2     0     0.1  
3     0     0.2  
4     0     0.3  
5     0     0.4  
6     0     0.5  
7     0     0.6  
8     0     0.7  
9     0     0.8  
10    0     0.9  
# ... with 8,271 more rows
```

```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot()
```

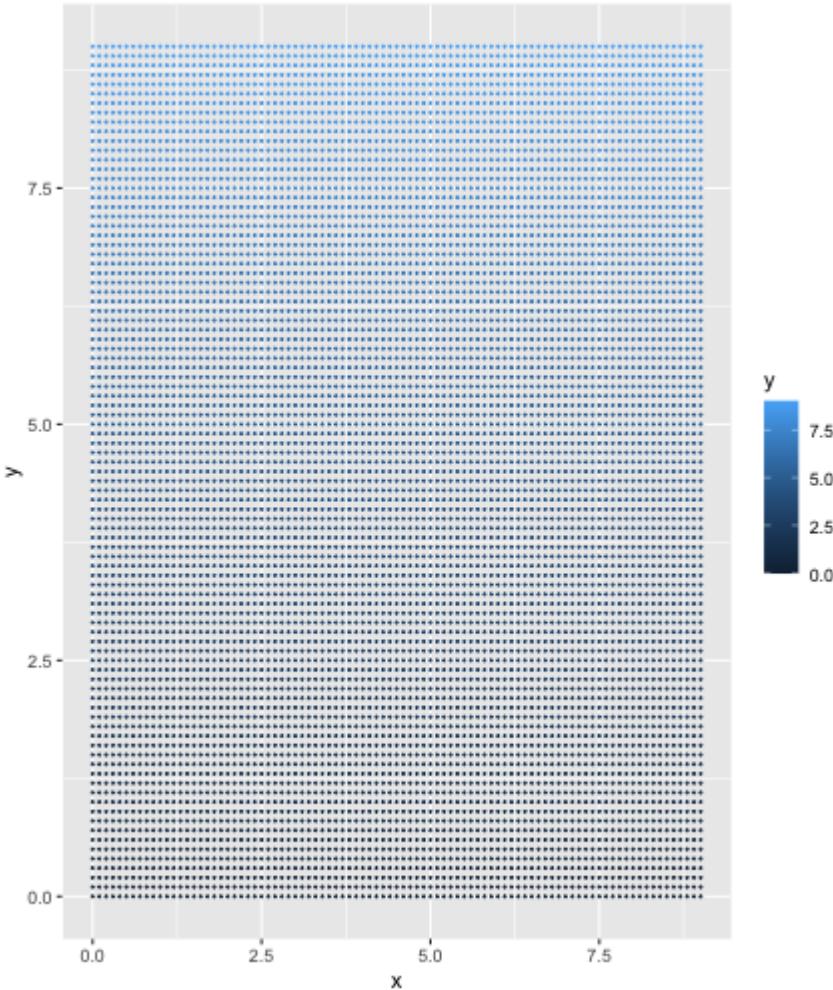
```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y)
```



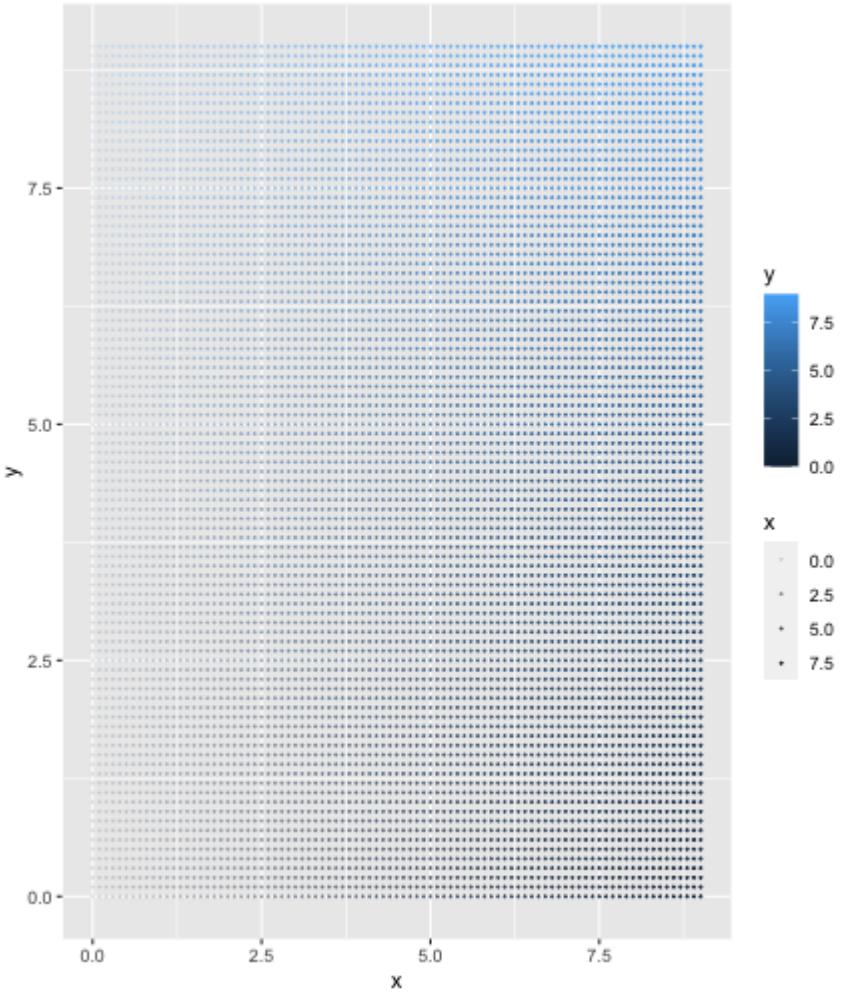
```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1)
```



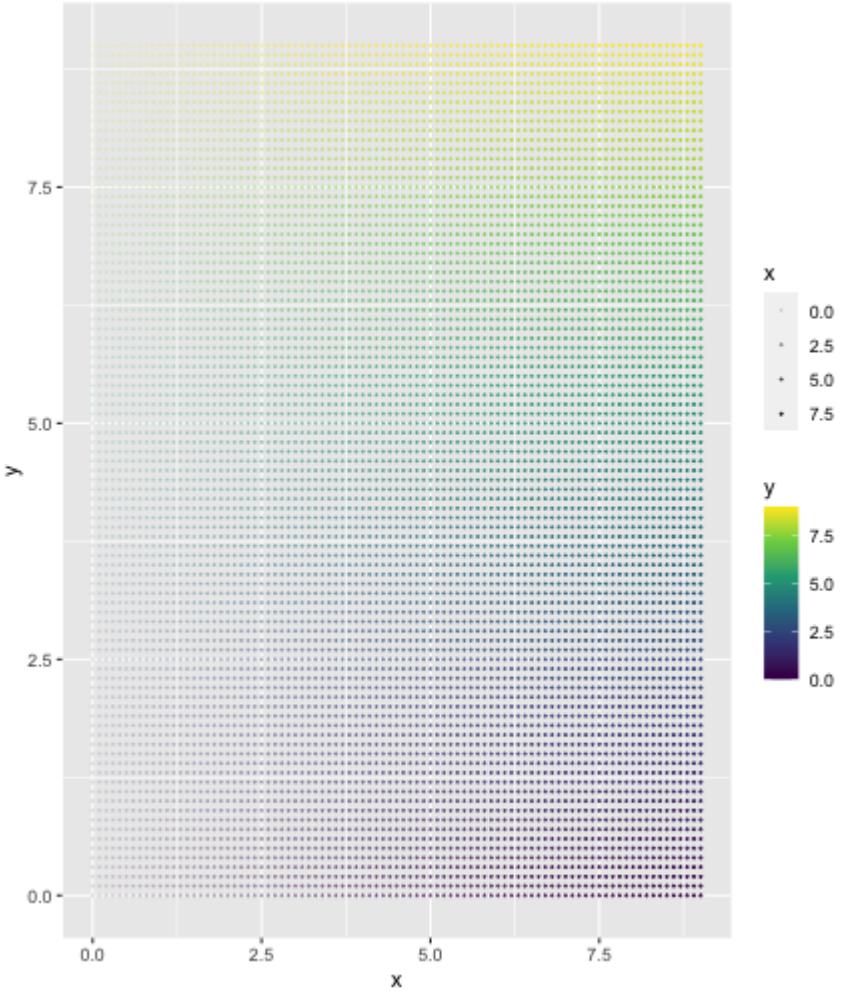
```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y)
```



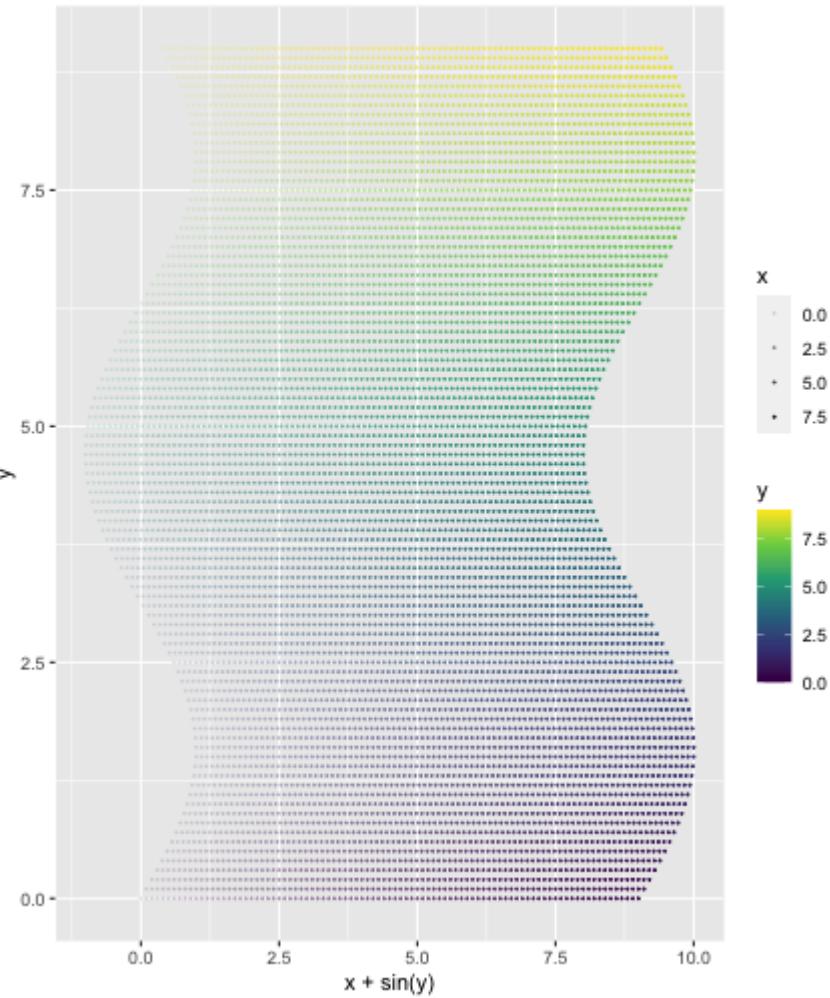
```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y) +  
aes(alpha = x)
```



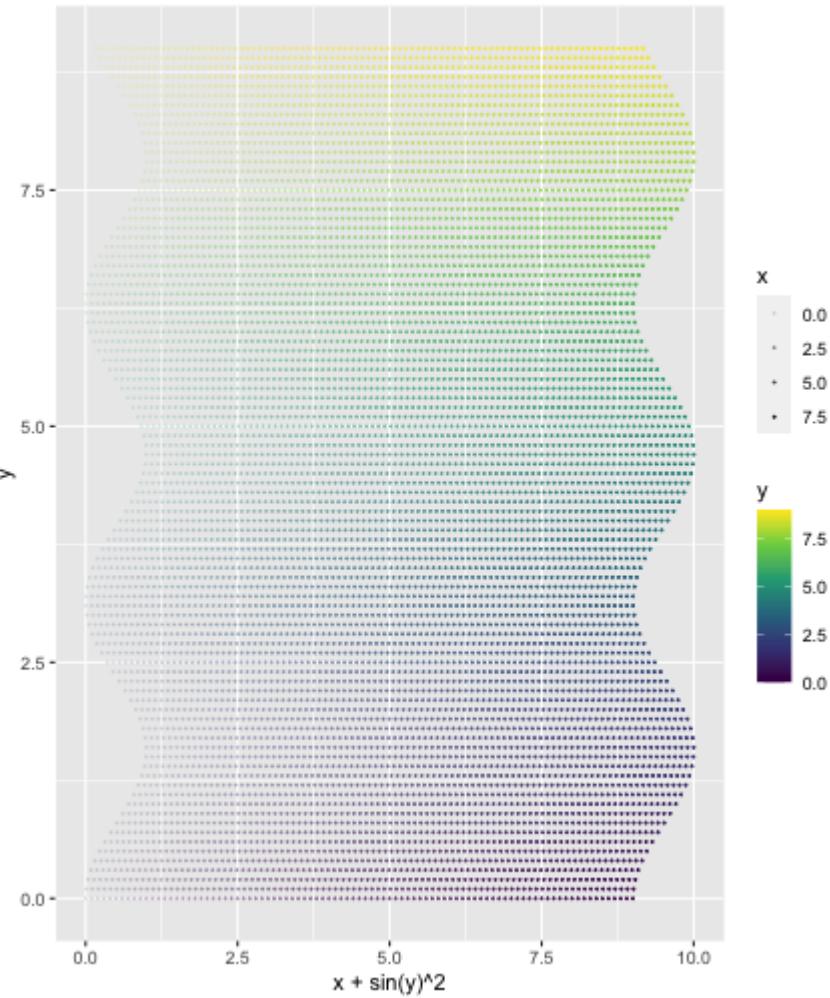
```
seq(0,9, by = 0.1) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(size = .1) +  
  aes(color = y) +  
  aes(alpha = x) +  
  scale_color_viridis_c()
```



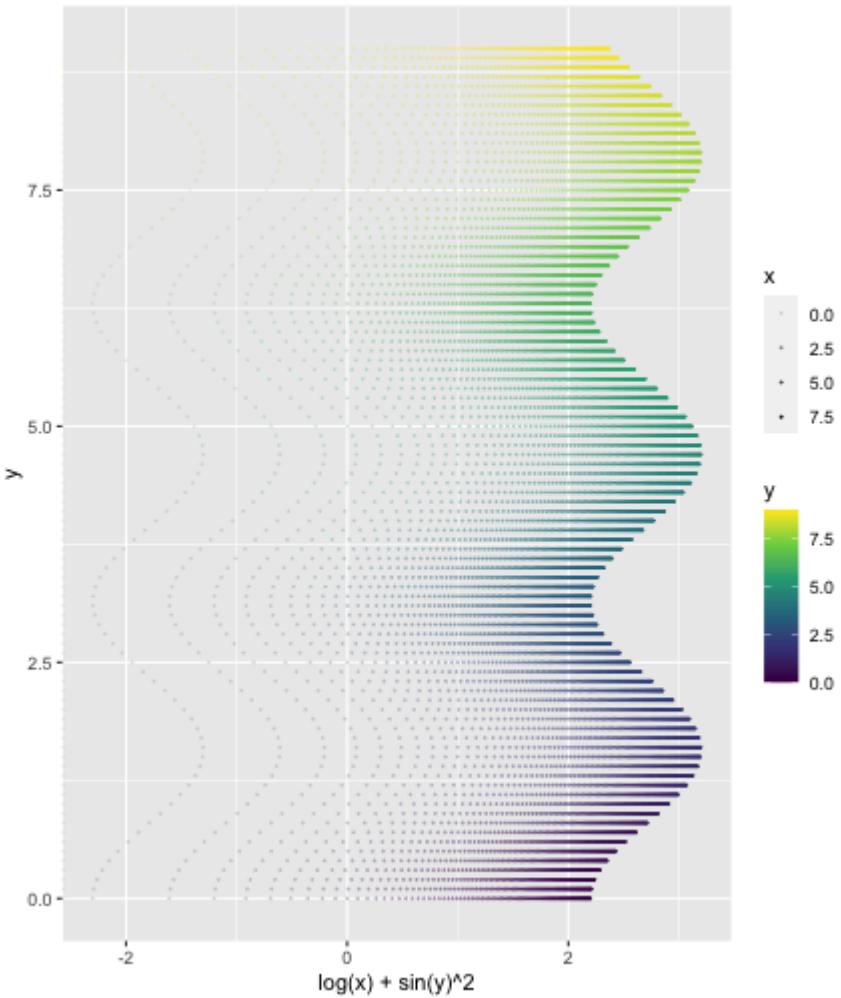
```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y))
```



```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(size = .1) +  
  aes(color = y) +  
  aes(alpha = x) +  
  scale_color_viridis_c() +  
  aes(x = x + sin(y)) +  
  aes(x = x + sin(y)^2)
```



```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)) +  
aes(x = x + sin(y)^2) +  
aes(x = log(x) + sin(y)^2)
```

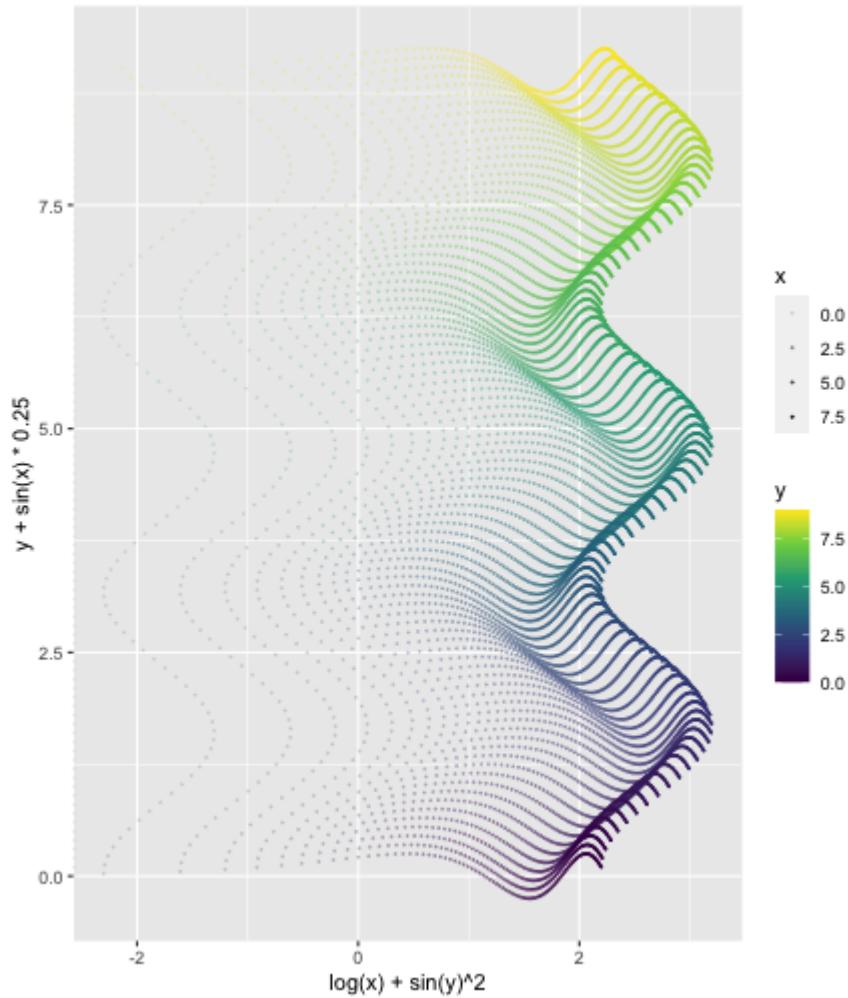


```

seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25)

```

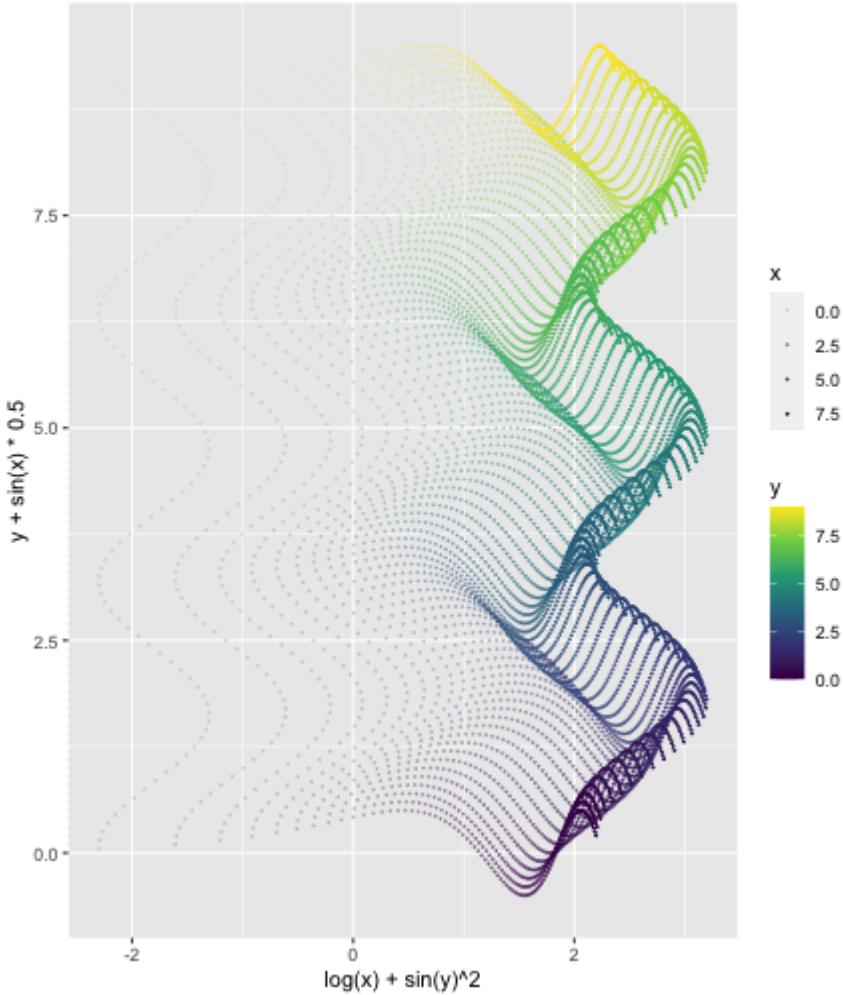


```

seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5)

```

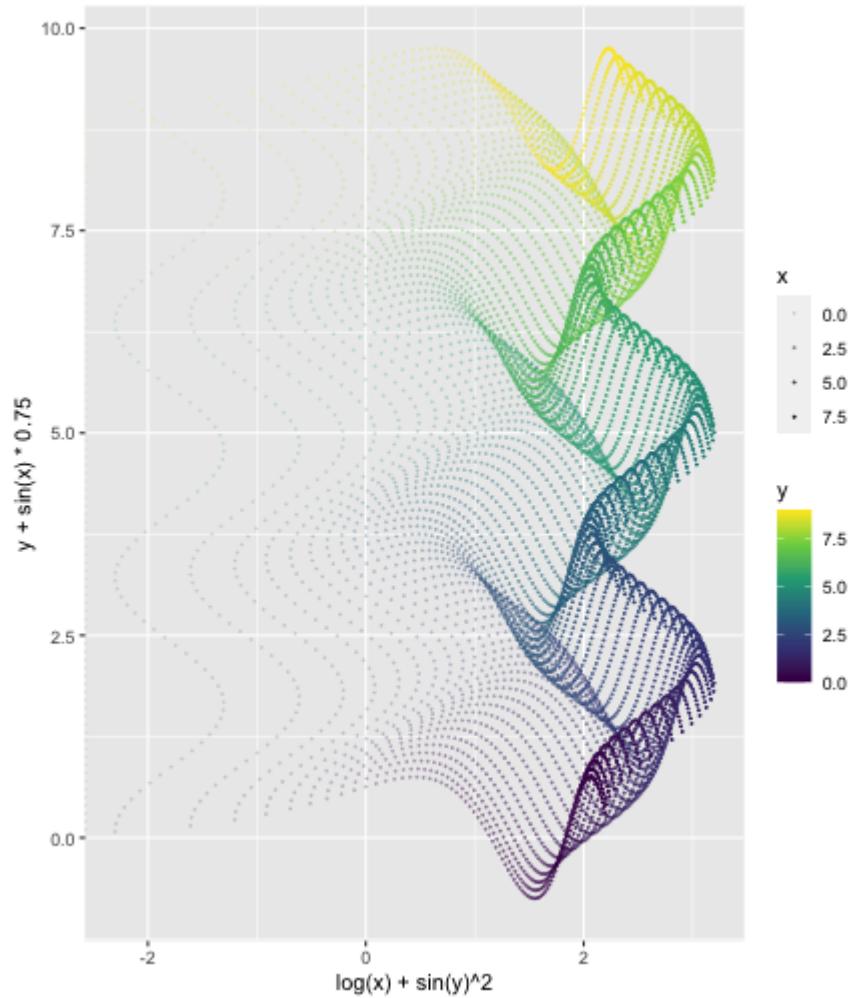


```

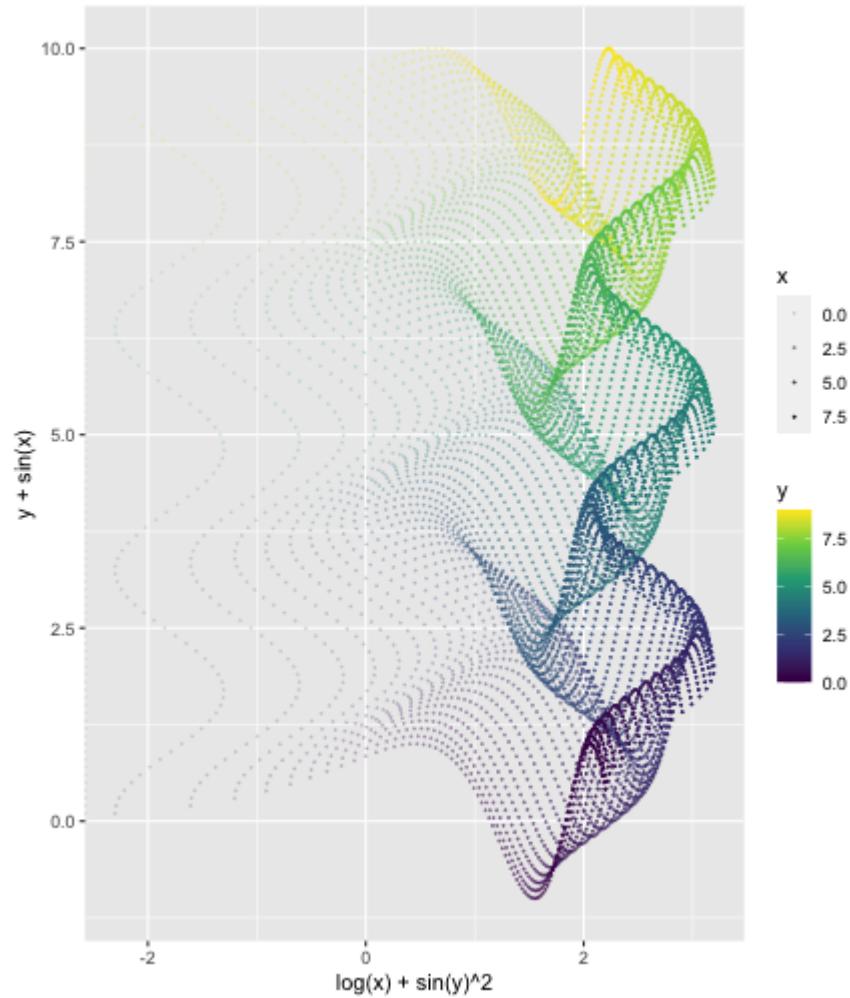
seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75)

```



```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)) +  
aes(x = x + sin(y)^2) +  
aes(x = log(x) + sin(y)^2) +  
aes(y = y + sin(x)*.25) +  
aes(y = y + sin(x)*.5) +  
aes(y = y + sin(x)*.75) +  
aes(y = y + sin(x))
```

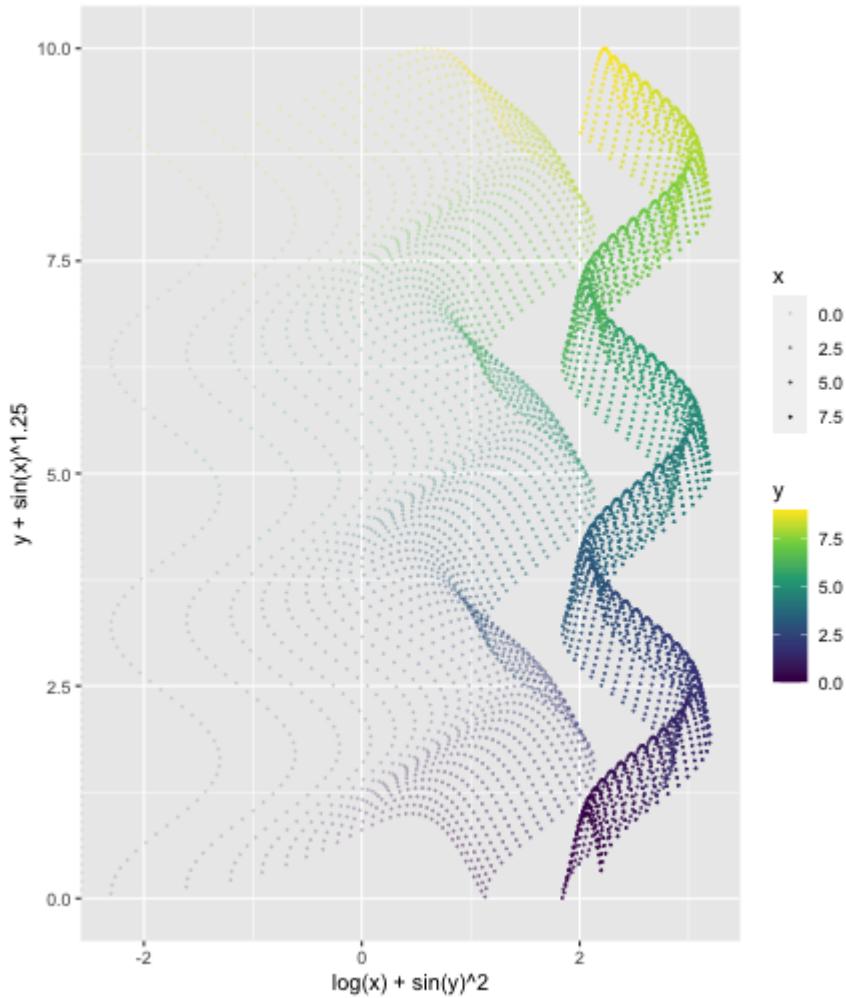


```

seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + sin(x)^1.25)

```

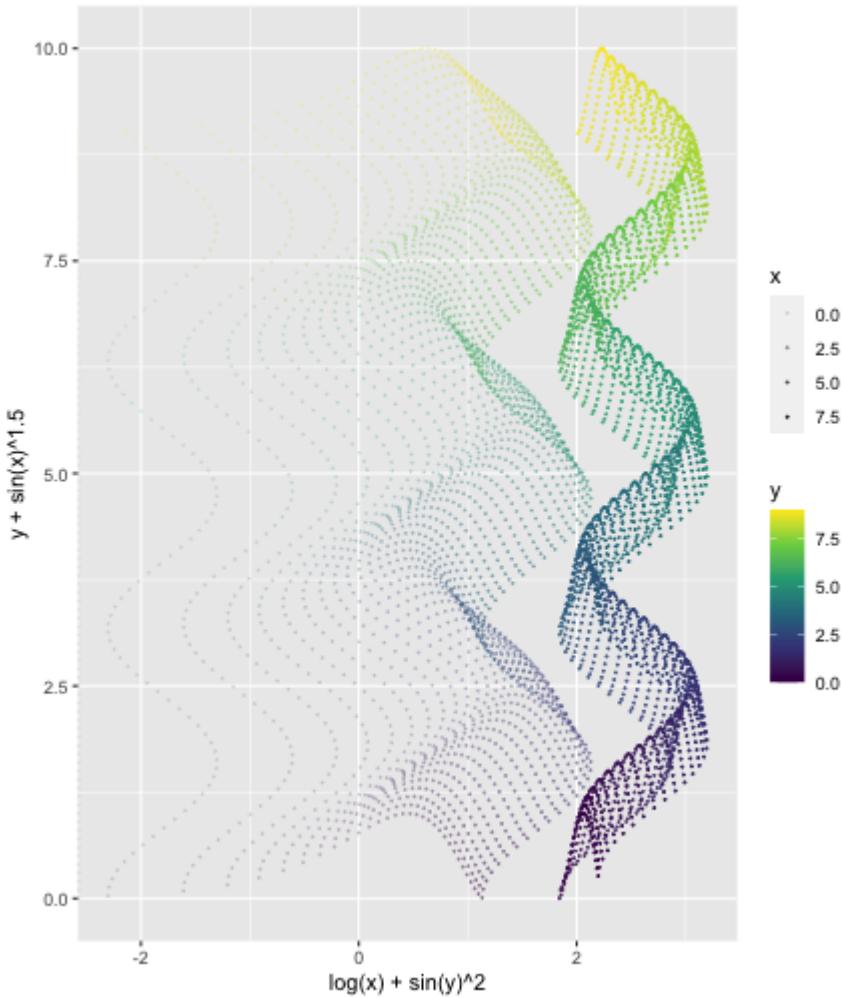


```

seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + sin(x)^1.25) +
  aes(y = y + sin(x)^1.5)

```

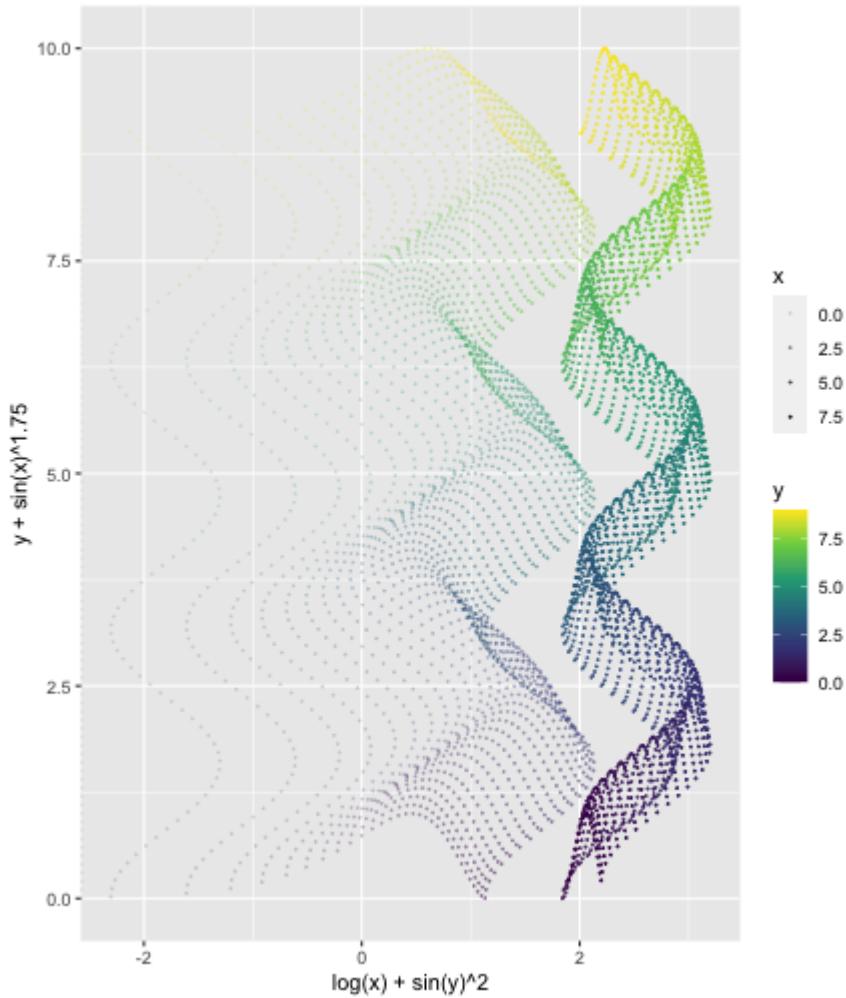


```

seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + sin(x)^1.25) +
  aes(y = y + sin(x)^1.5) +
  aes(y = y + sin(x)^1.75)

```

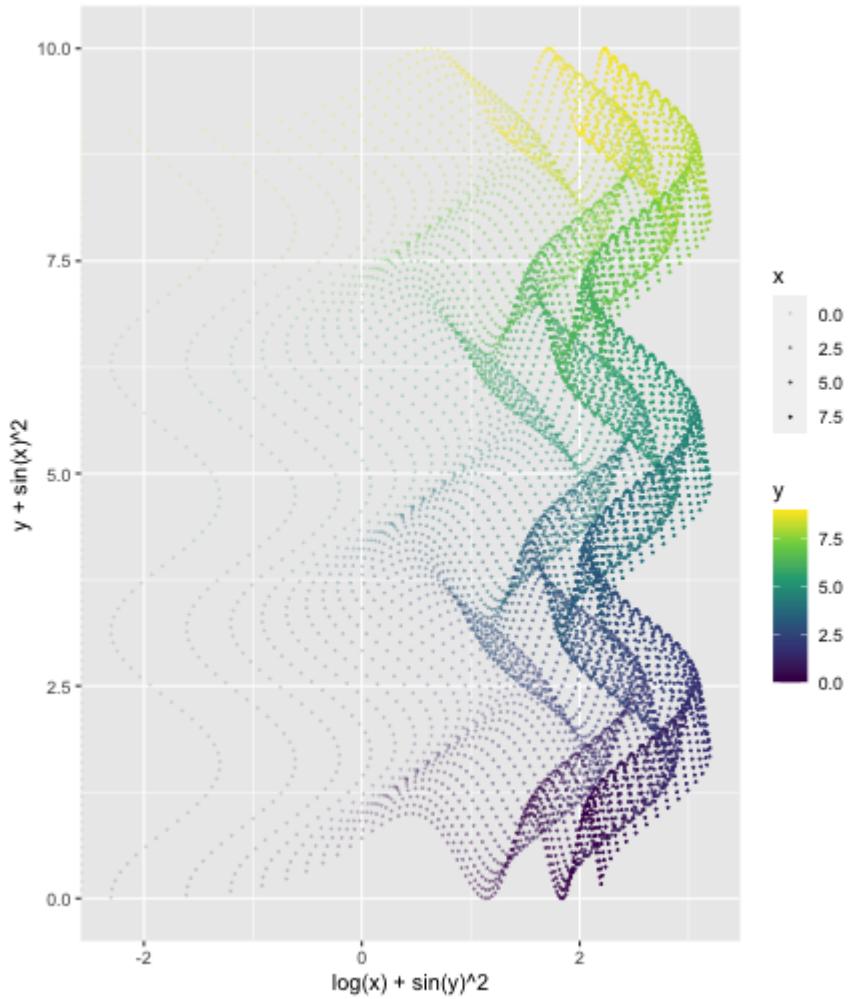


```

seq(0,9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + sin(x)^1.25) +
  aes(y = y + sin(x)^1.5) +
  aes(y = y + sin(x)^1.75) +
  aes(y = y + sin(x)^2)

```

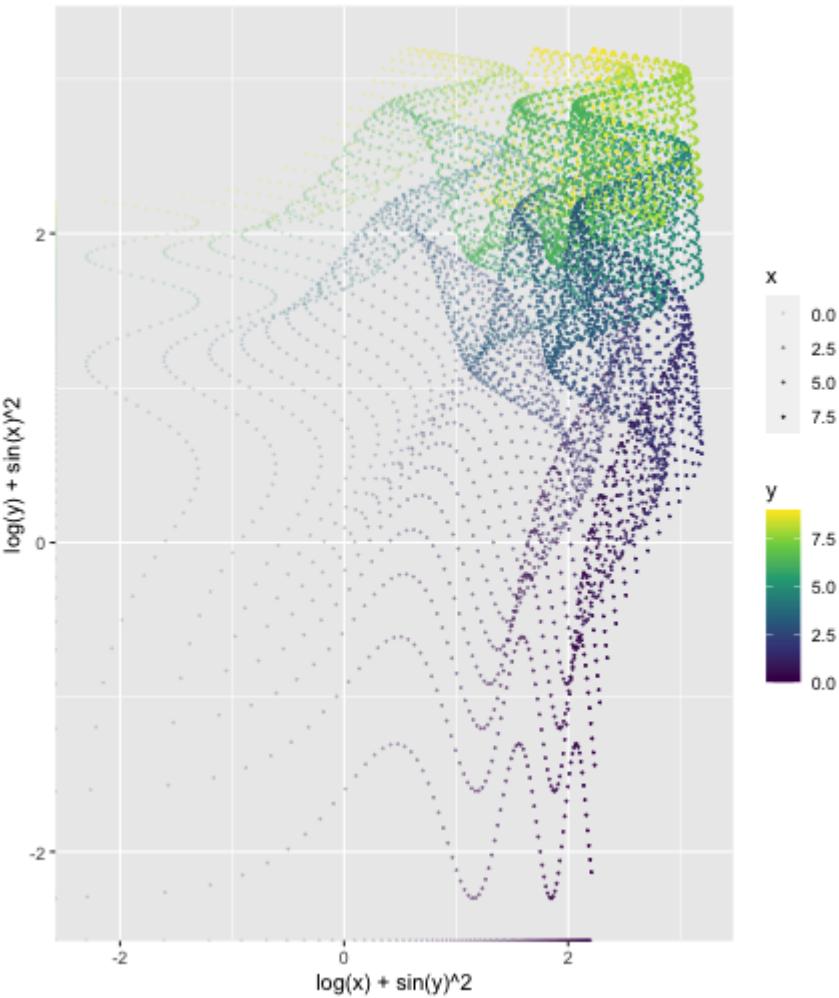


```

seq(0, 9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + sin(x)^1.25) +
  aes(y = y + sin(x)^1.5) +
  aes(y = y + sin(x)^1.75) +
  aes(y = y + sin(x)^2) +
  aes(y = log(y) + sin(x)^2)

```

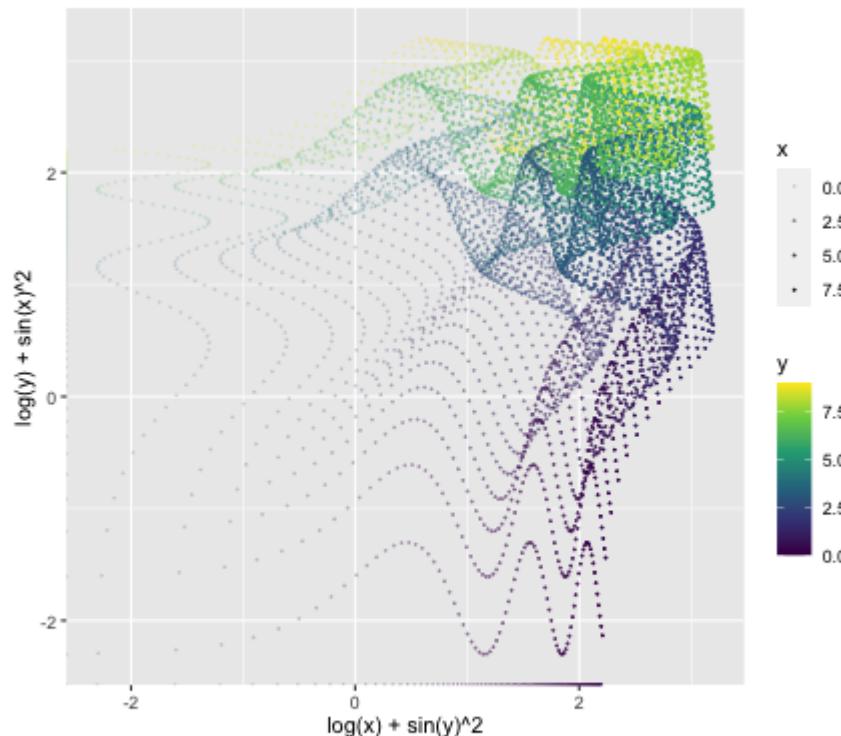


```

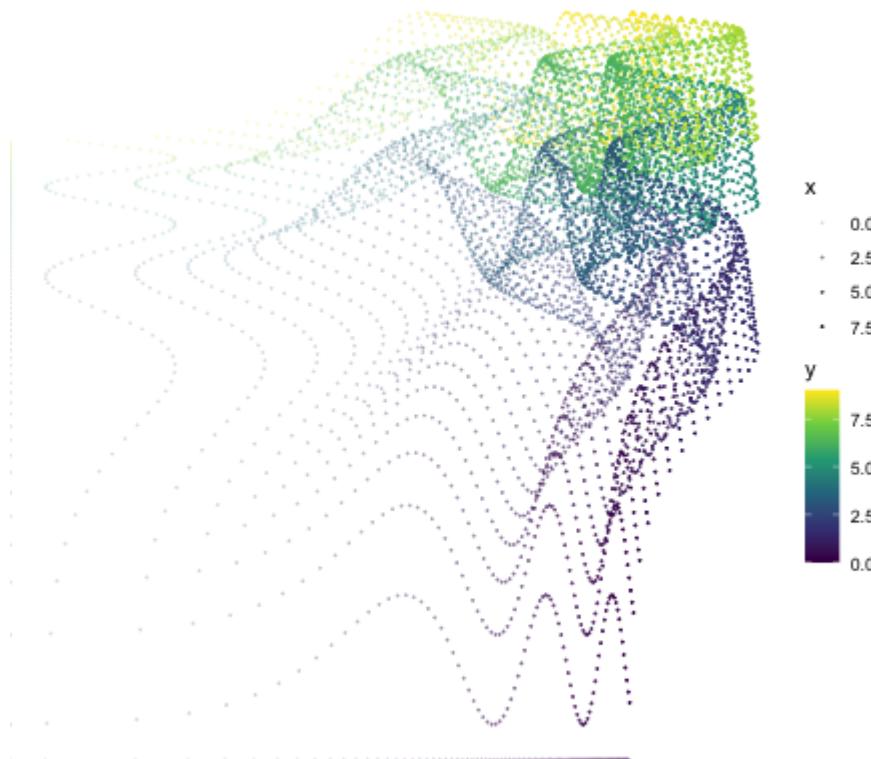
seq(0, 9, by = 0.1) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = .1) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.25) +
  aes(y = y + sin(x)*.5) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + sin(x)^1.25) +
  aes(y = y + sin(x)^1.5) +
  aes(y = y + sin(x)^1.75) +
  aes(y = y + sin(x)^2) +
  aes(y = log(y) + sin(x)^2) +
  coord_equal()

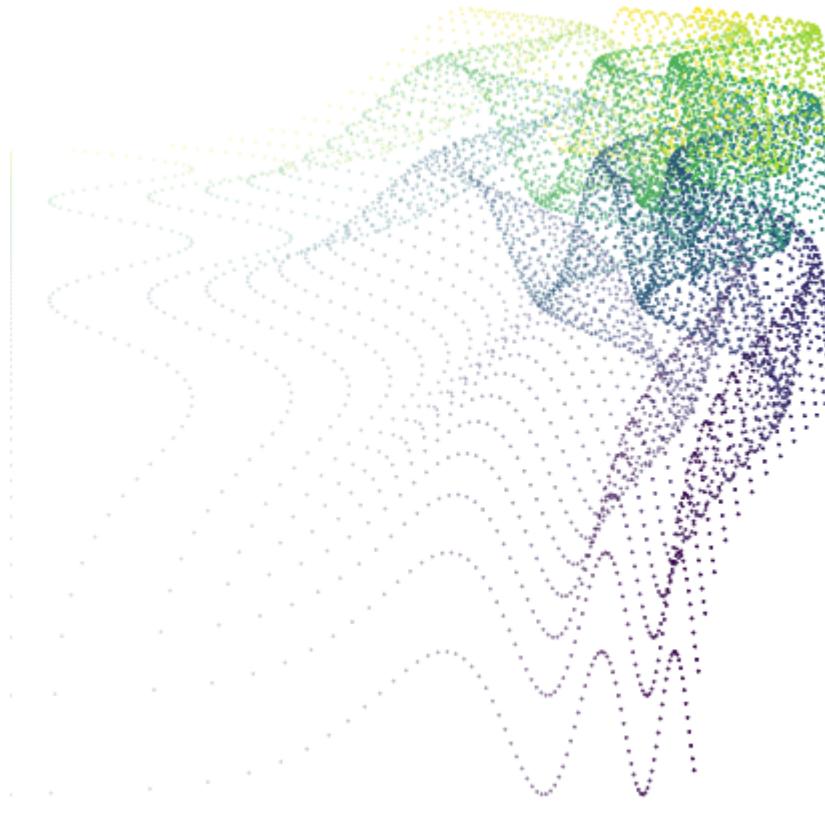
```



```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)) +  
aes(x = x + sin(y)^2) +  
aes(x = log(x) + sin(y)^2) +  
aes(y = y + sin(x)*.25) +  
aes(y = y + sin(x)*.5) +  
aes(y = y + sin(x)*.75) +  
aes(y = y + sin(x)) +  
aes(y = y + sin(x)^1.25) +  
aes(y = y + sin(x)^1.5) +  
aes(y = y + sin(x)^1.75) +  
aes(y = y + sin(x)^2) +  
aes(y = log(y) + sin(x)^2) +  
coord_equal() +  
theme_void()
```



```
seq(0,9, by = 0.1) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = .1) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)) +  
aes(x = x + sin(y)^2) +  
aes(x = log(x) + sin(y)^2) +  
aes(y = y + sin(x)*.25) +  
aes(y = y + sin(x)*.5) +  
aes(y = y + sin(x)*.75) +  
aes(y = y + sin(x)) +  
aes(y = y + sin(x)^1.25) +  
aes(y = y + sin(x)^1.5) +  
aes(y = y + sin(x)^1.75) +  
aes(y = y + sin(x)^2) +  
aes(y = log(y) + sin(x)^2) +  
coord_equal() +  
theme_void() +  
theme(legend.position = "none")
```



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```
seq(0,9, by = 0.025)
```

```
[1] 0.000 0.025 0.050 0.075 0.100 0.125 0.150 0.175 0.200 0.225 0.250 0.275  
[13] 0.300 0.325 0.350 0.375 0.400 0.425 0.450 0.475 0.500 0.525 0.550 0.575  
[25] 0.600 0.625 0.650 0.675 0.700 0.725 0.750 0.775 0.800 0.825 0.850 0.875  
[37] 0.900 0.925 0.950 0.975 1.000 1.025 1.050 1.075 1.100 1.125 1.150 1.175  
[49] 1.200 1.225 1.250 1.275 1.300 1.325 1.350 1.375 1.400 1.425 1.450 1.475  
[61] 1.500 1.525 1.550 1.575 1.600 1.625 1.650 1.675 1.700 1.725 1.750 1.775  
[73] 1.800 1.825 1.850 1.875 1.900 1.925 1.950 1.975 2.000 2.025 2.050 2.075  
[85] 2.100 2.125 2.150 2.175 2.200 2.225 2.250 2.275 2.300 2.325 2.350 2.375  
[97] 2.400 2.425 2.450 2.475 2.500 2.525 2.550 2.575 2.600 2.625 2.650 2.675  
[109] 2.700 2.725 2.750 2.775 2.800 2.825 2.850 2.875 2.900 2.925 2.950 2.975  
[121] 3.000 3.025 3.050 3.075 3.100 3.125 3.150 3.175 3.200 3.225 3.250 3.275  
[133] 3.300 3.325 3.350 3.375 3.400 3.425 3.450 3.475 3.500 3.525 3.550 3.575  
[145] 3.600 3.625 3.650 3.675 3.700 3.725 3.750 3.775 3.800 3.825 3.850 3.875  
[157] 3.900 3.925 3.950 3.975 4.000 4.025 4.050 4.075 4.100 4.125 4.150 4.175  
[169] 4.200 4.225 4.250 4.275 4.300 4.325 4.350 4.375 4.400 4.425 4.450 4.475  
[181] 4.500 4.525 4.550 4.575 4.600 4.625 4.650 4.675 4.700 4.725 4.750 4.775  
[193] 4.800 4.825 4.850 4.875 4.900 4.925 4.950 4.975 5.000 5.025 5.050 5.075  
[205] 5.100 5.125 5.150 5.175 5.200 5.225 5.250 5.275 5.300 5.325 5.350 5.375  
[217] 5.400 5.425 5.450 5.475 5.500 5.525 5.550 5.575 5.600 5.625 5.650 5.675  
[229] 5.700 5.725 5.750 5.775 5.800 5.825 5.850 5.875 5.900 5.925 5.950 5.975  
[241] 6.000 6.025 6.050 6.075 6.100 6.125 6.150 6.175 6.200 6.225 6.250 6.275  
[253] 6.300 6.325 6.350 6.375 6.400 6.425 6.450 6.475 6.500 6.525 6.550 6.575  
[265] 6.600 6.625 6.650 6.675 6.700 6.725 6.750 6.775 6.800 6.825 6.850 6.875  
[277] 6.900 6.925 6.950 6.975 7.000 7.025 7.050 7.075 7.100 7.125 7.150 7.175  
[289] 7.200 7.225 7.250 7.275 7.300 7.325 7.350 7.375 7.400 7.425 7.450 7.475  
[301] 7.500 7.525 7.550 7.575 7.600 7.625 7.650 7.675 7.700 7.725 7.750 7.775  
[313] 7.800 7.825 7.850 7.875 7.900 7.925 7.950 7.975 8.000 8.025 8.050 8.075  
[325] 8.100 8.125 8.150 8.175 8.200 8.225 8.250 8.275 8.300 8.325 8.350 8.375  
[337] 8.400 8.425 8.450 8.475 8.500 8.525 8.550 8.575 8.600 8.625 8.650 8.675  
[349] 8.700 8.725 8.750 8.775 8.800 8.825 8.850 8.875 8.900 8.925 8.950 8.975  
[361] 9.000
```

```
seq(0,9, by = 0.025) ->  
my_seq
```

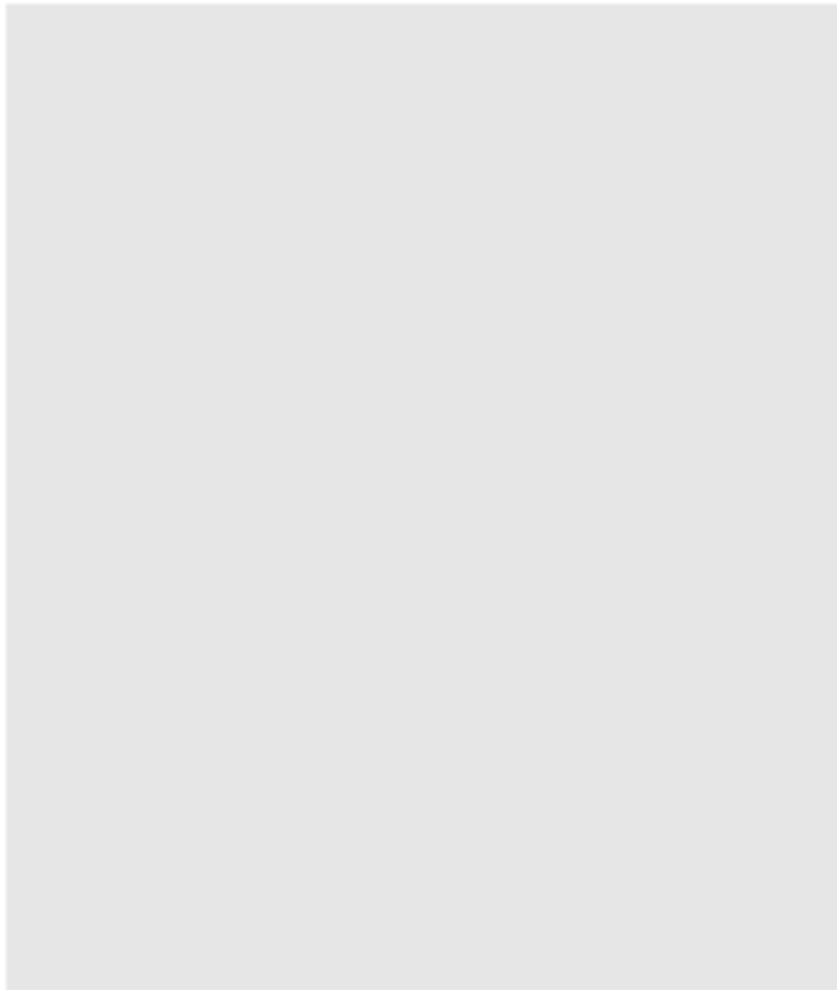
```
seq(0, 9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq)
```

```
# A tibble: 361 x 1  
      x  
     <dbl>  
1 0  
2 0.025  
3 0.05  
4 0.075  
5 0.1  
6 0.125  
7 0.15  
8 0.175  
9 0.2  
10 0.225  
# ... with 351 more rows
```

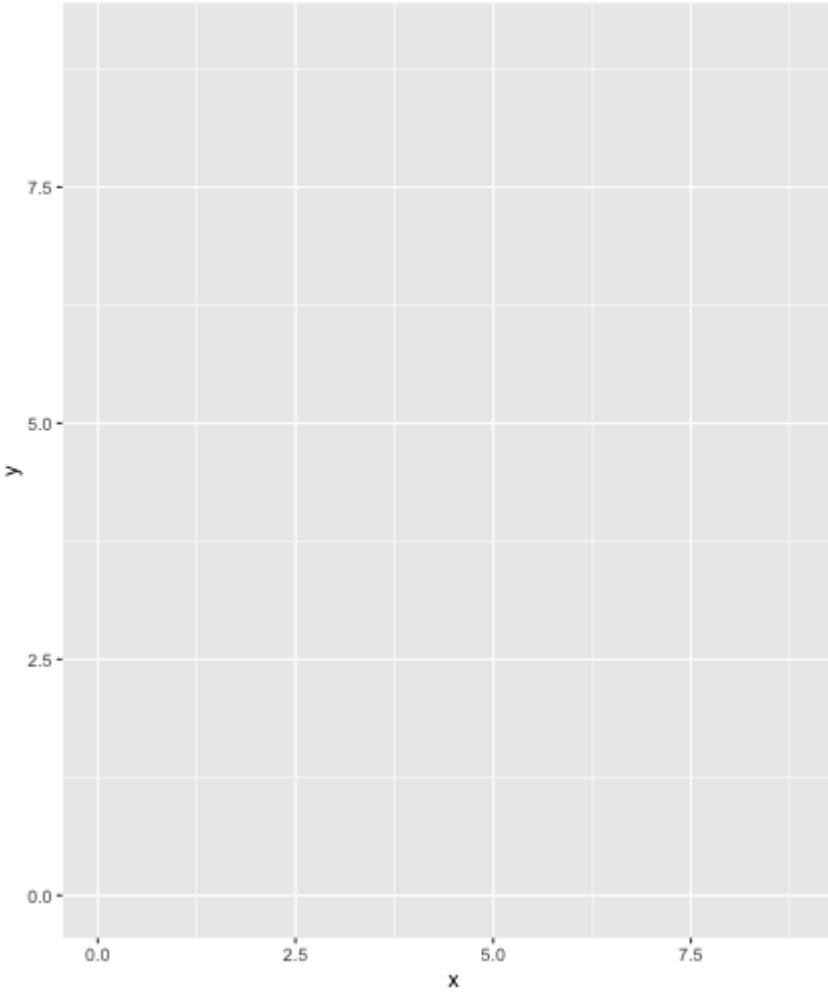
```
seq(0,9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq)
```

```
# A tibble: 130,321 x 2  
      x     y  
  <dbl> <dbl>  
1     0  0  
2     0  0.025  
3     0  0.05  
4     0  0.075  
5     0  0.1  
6     0  0.125  
7     0  0.15  
8     0  0.175  
9     0  0.2  
10    0  0.225  
# ... with 130,311 more rows
```

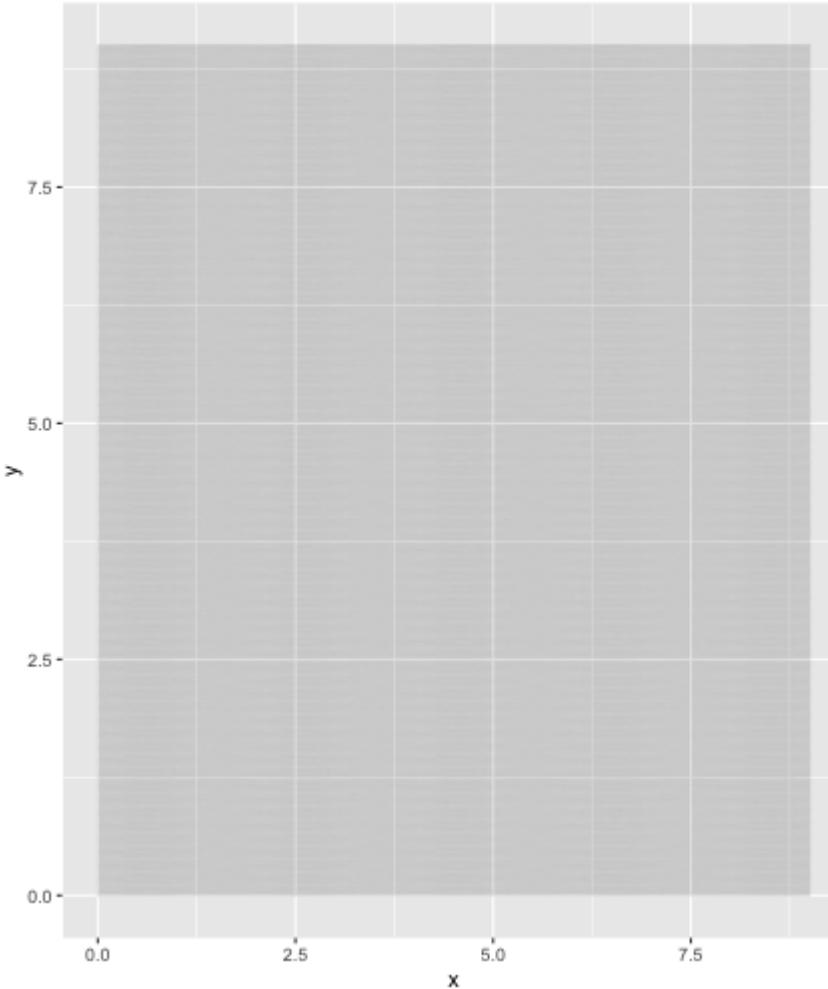
```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot()
```



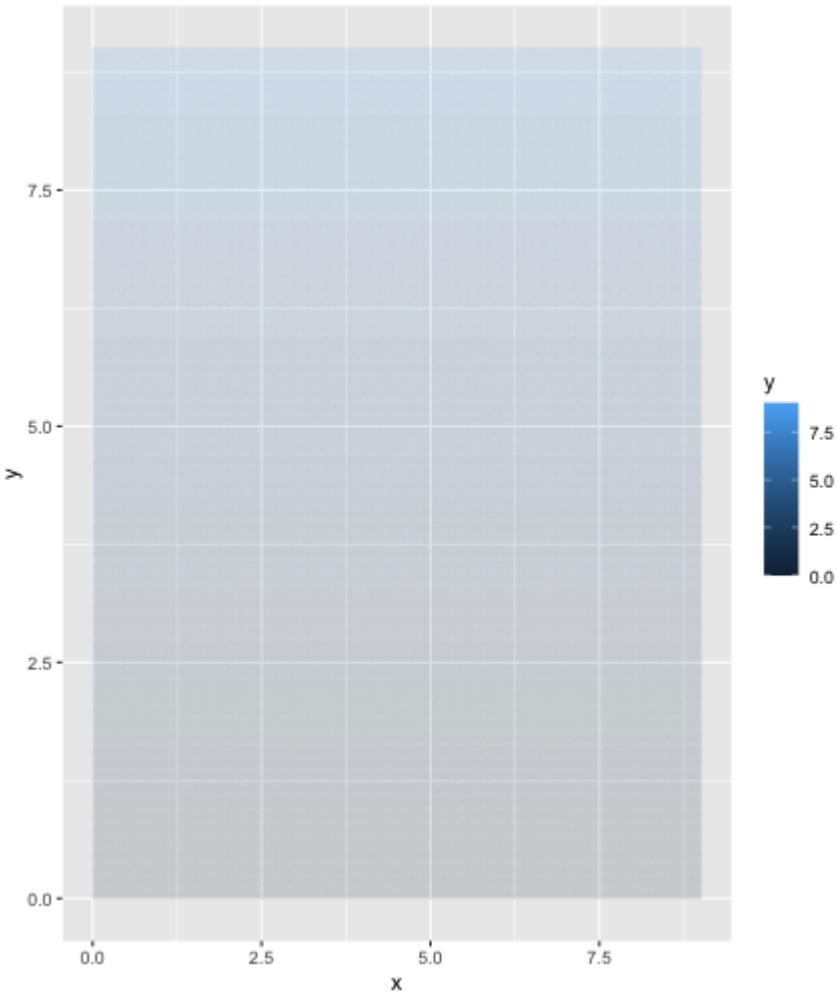
```
seq(0, 9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y)
```



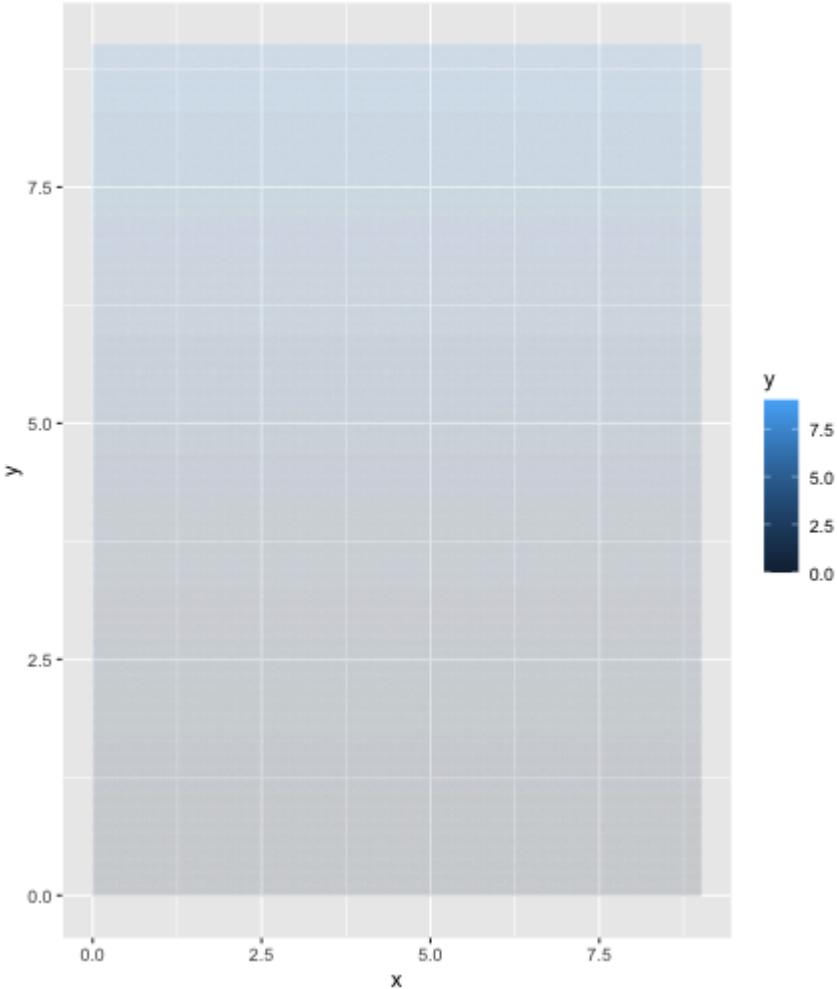
```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05)
```



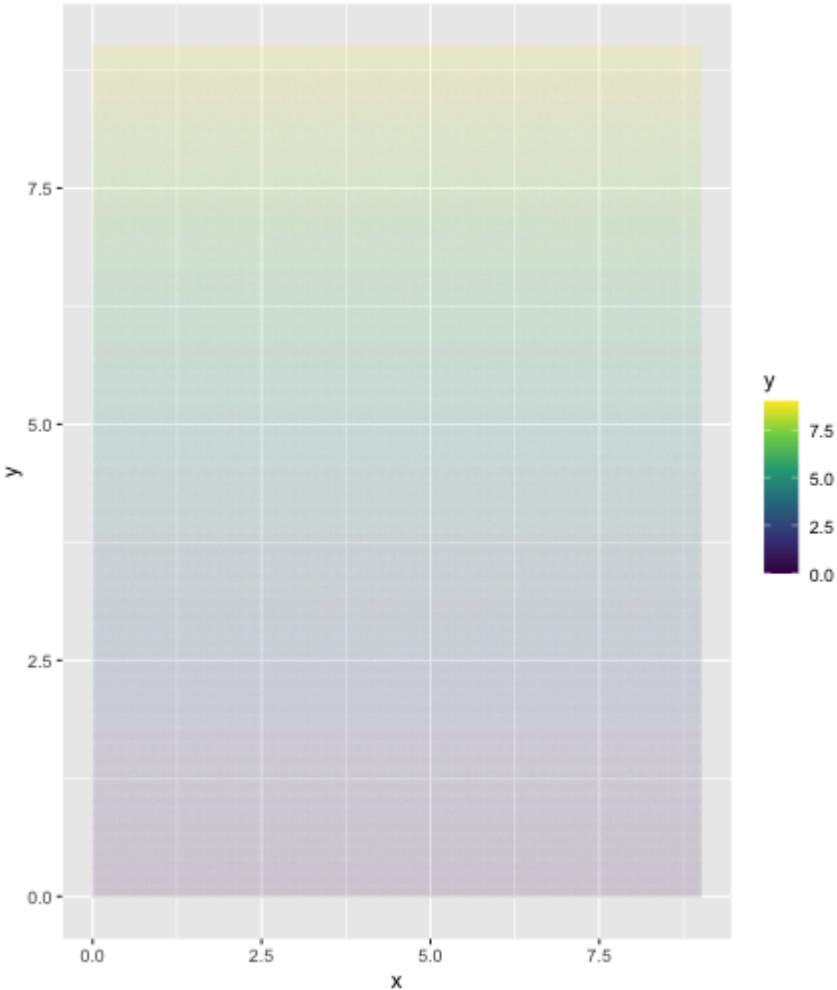
```
seq(0,9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(size = 0, alpha = .05) +  
  aes(color = y)
```



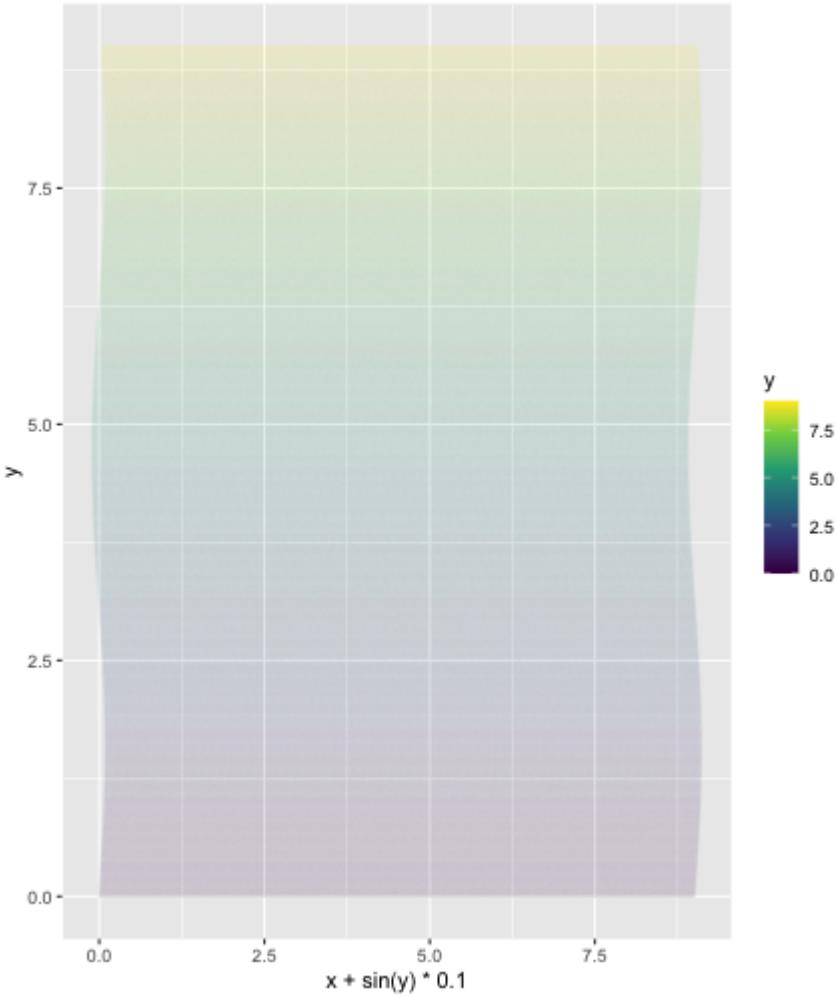
```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x)
```



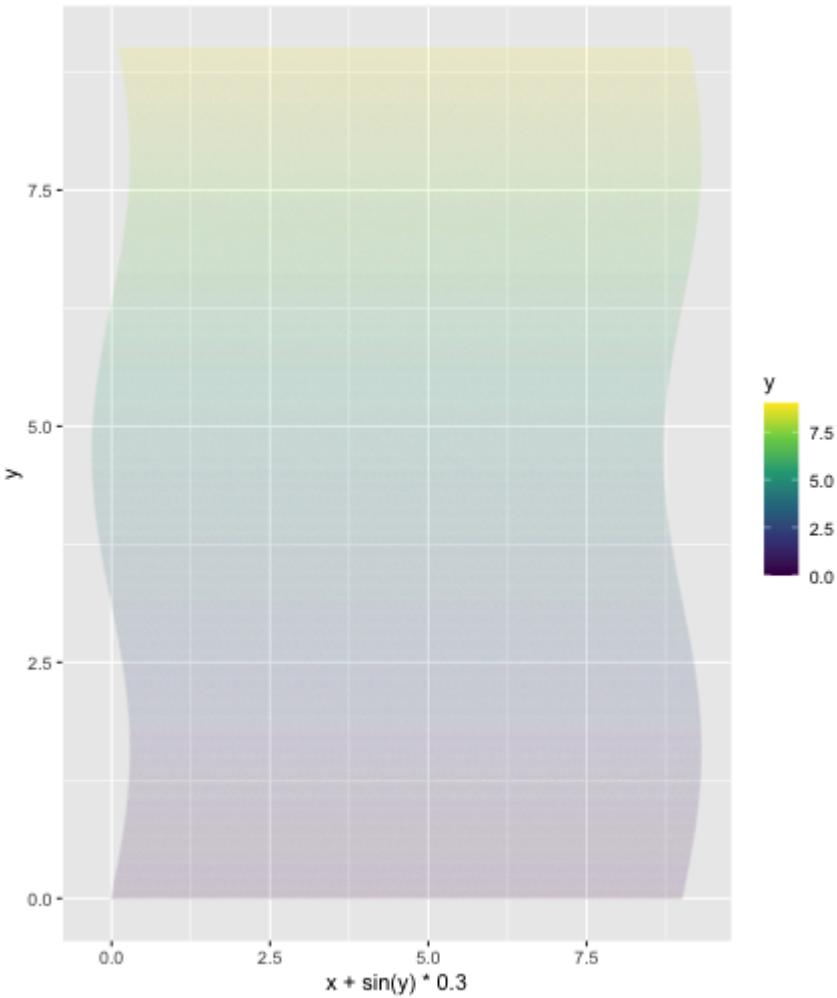
```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c()
```



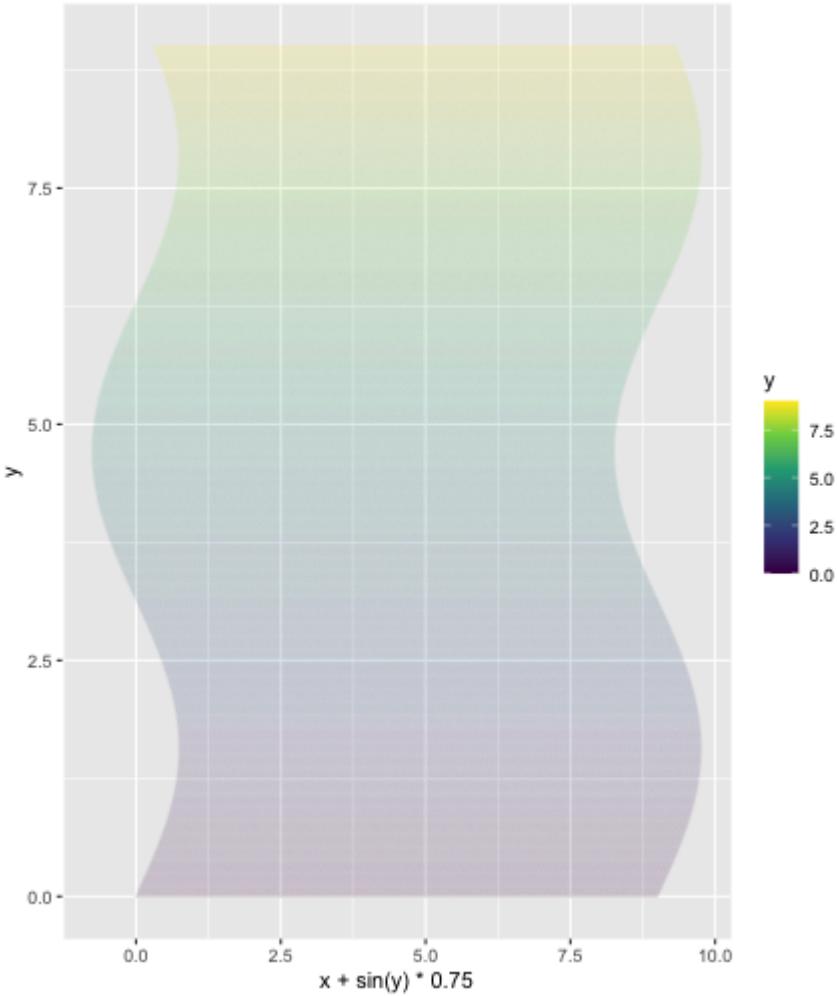
```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)*.1)
```



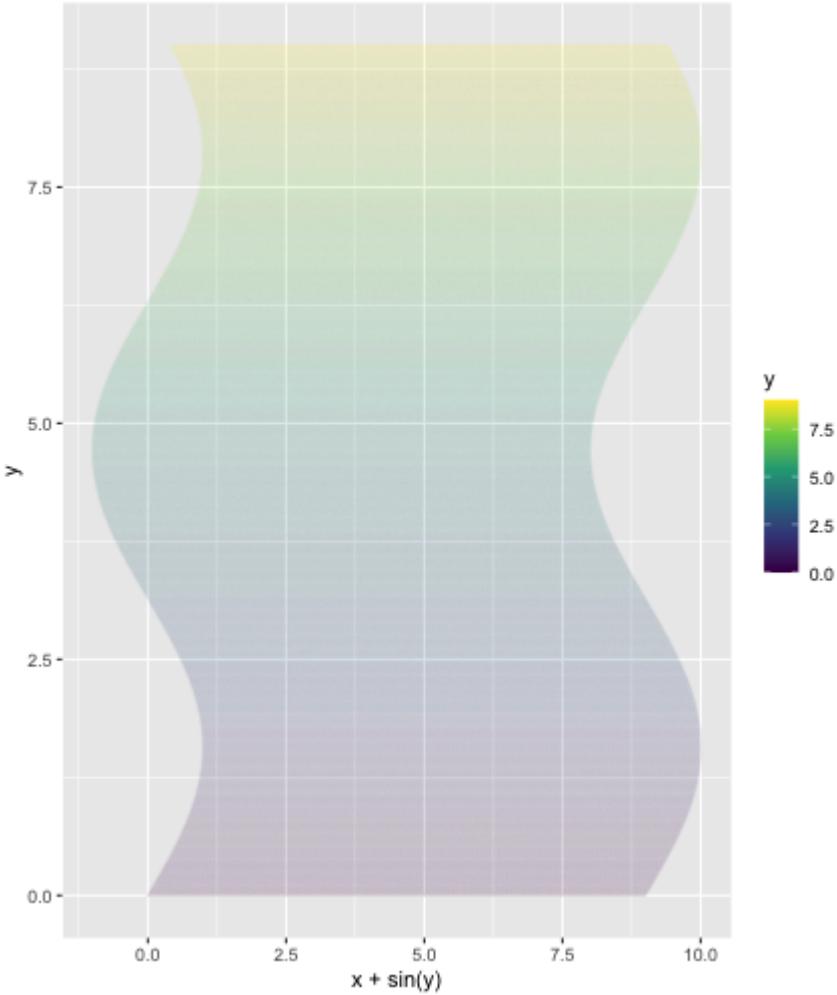
```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)*.1) +  
aes(x = x + sin(y)*.3)
```



```
seq(0, 9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(size = 0, alpha = .05) +  
  aes(color = y) +  
  aes(alpha = x) +  
  scale_color_viridis_c() +  
  aes(x = x + sin(y)*.1) +  
  aes(x = x + sin(y)*.3) +  
  aes(x = x + sin(y)*.75)
```



```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)*.1) +  
aes(x = x + sin(y)*.3) +  
aes(x = x + sin(y)*.75) +  
aes(x = x + sin(y))
```

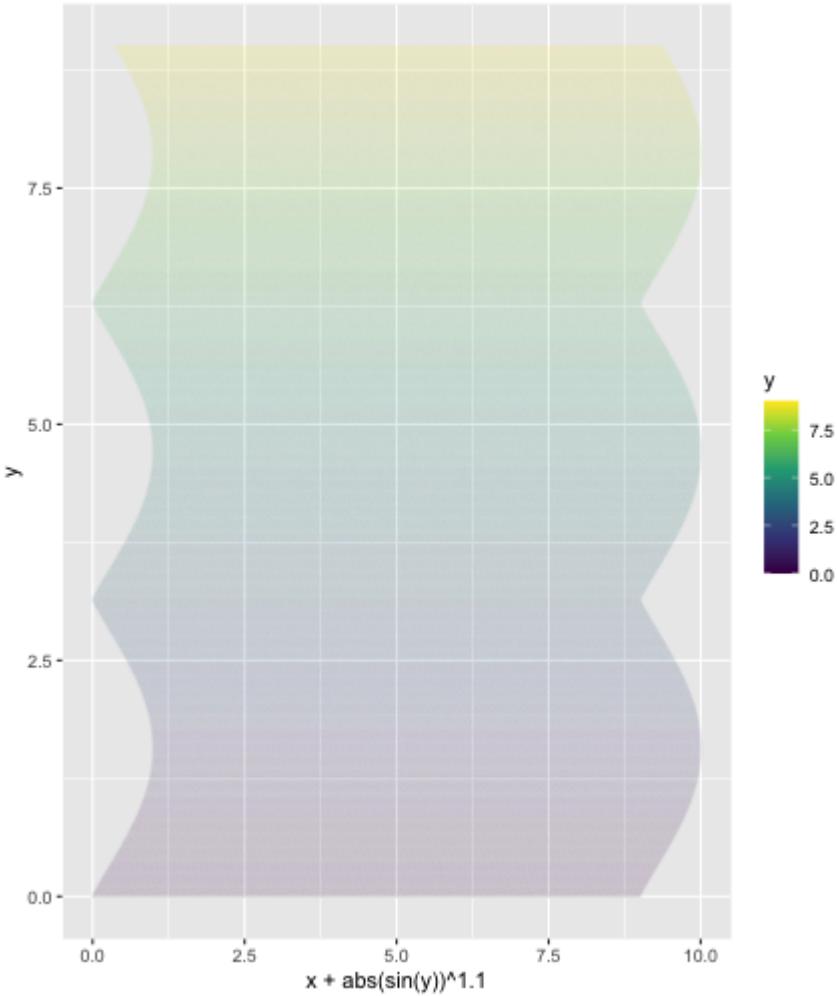


```

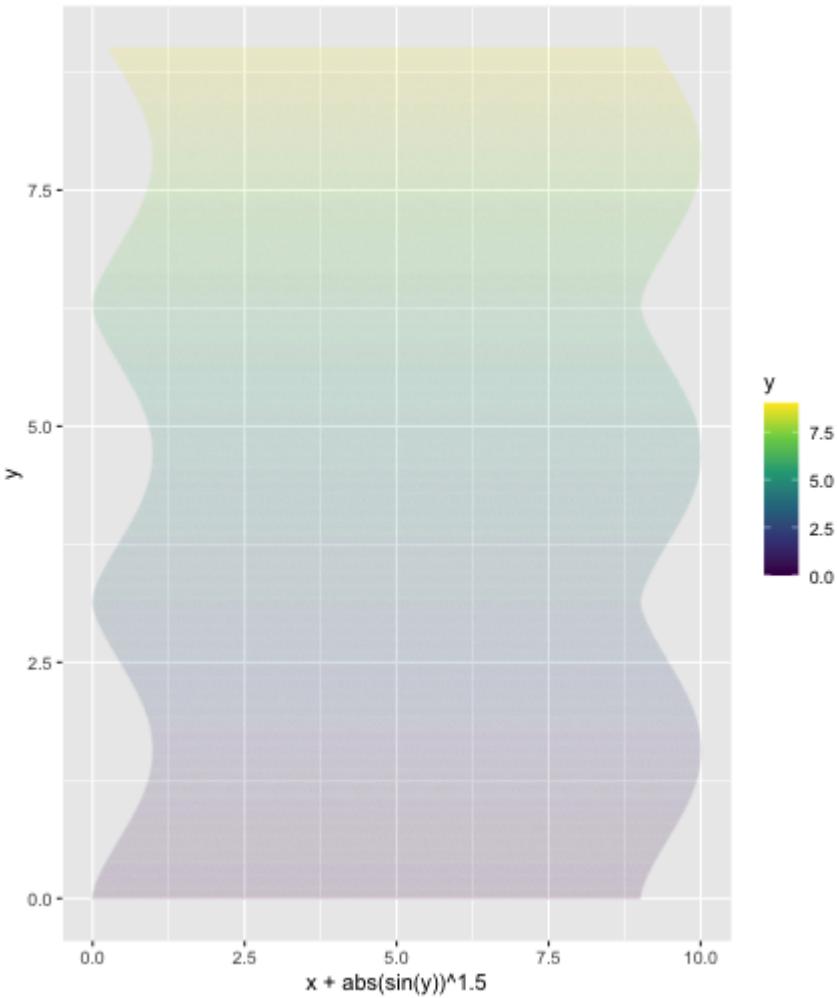
seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1)

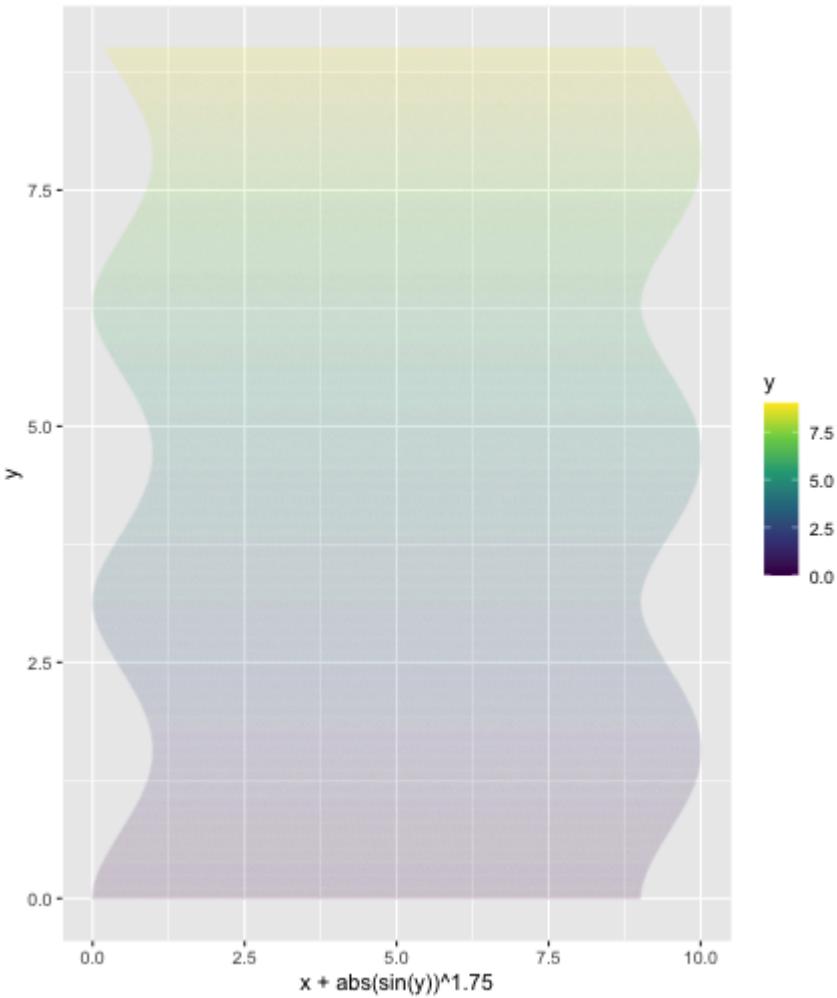
```



```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)*.1) +  
aes(x = x + sin(y)*.3) +  
aes(x = x + sin(y)*.75) +  
aes(x = x + sin(y)) +  
aes(x = x + abs(sin(y))^1.1) +  
aes(x = x + abs(sin(y))^1.5)
```



```
seq(0,9, by = 0.025) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(size = 0, alpha = .05) +  
aes(color = y) +  
aes(alpha = x) +  
scale_color_viridis_c() +  
aes(x = x + sin(y)*.1) +  
aes(x = x + sin(y)*.3) +  
aes(x = x + sin(y)*.75) +  
aes(x = x + sin(y)) +  
aes(x = x + abs(sin(y))^1.1) +  
aes(x = x + abs(sin(y))^1.5) +  
aes(x = x + abs(sin(y))^1.75)
```

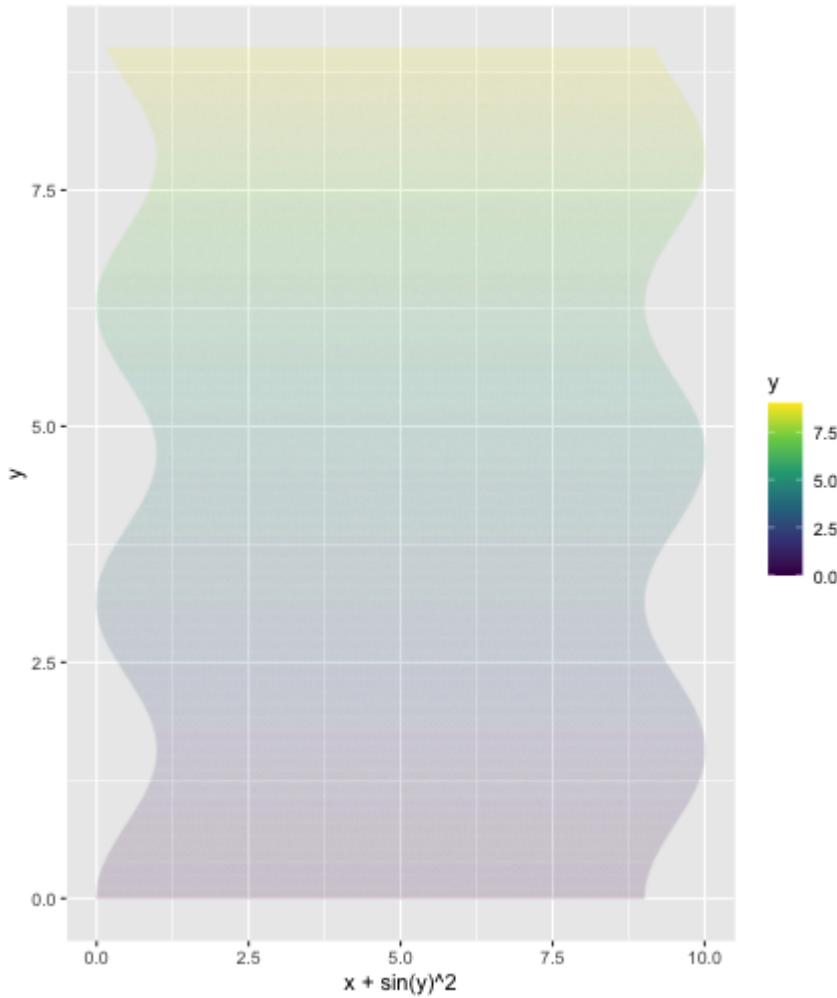


```

seq(0, 9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2)

```

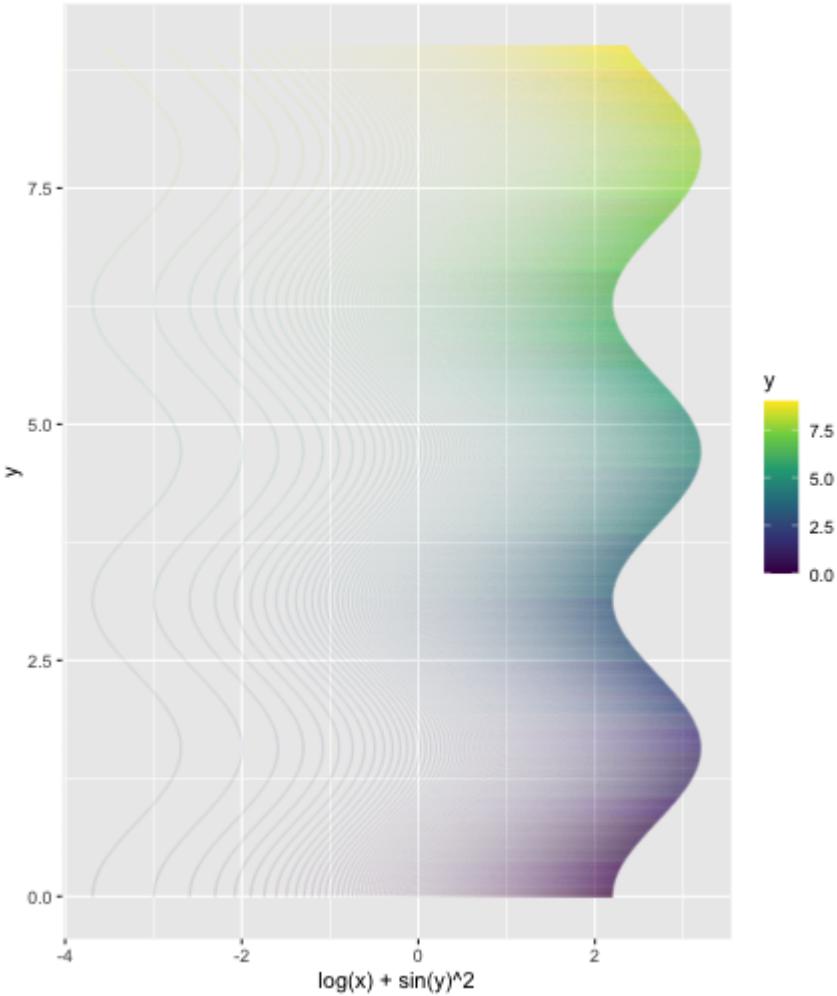


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2)

```

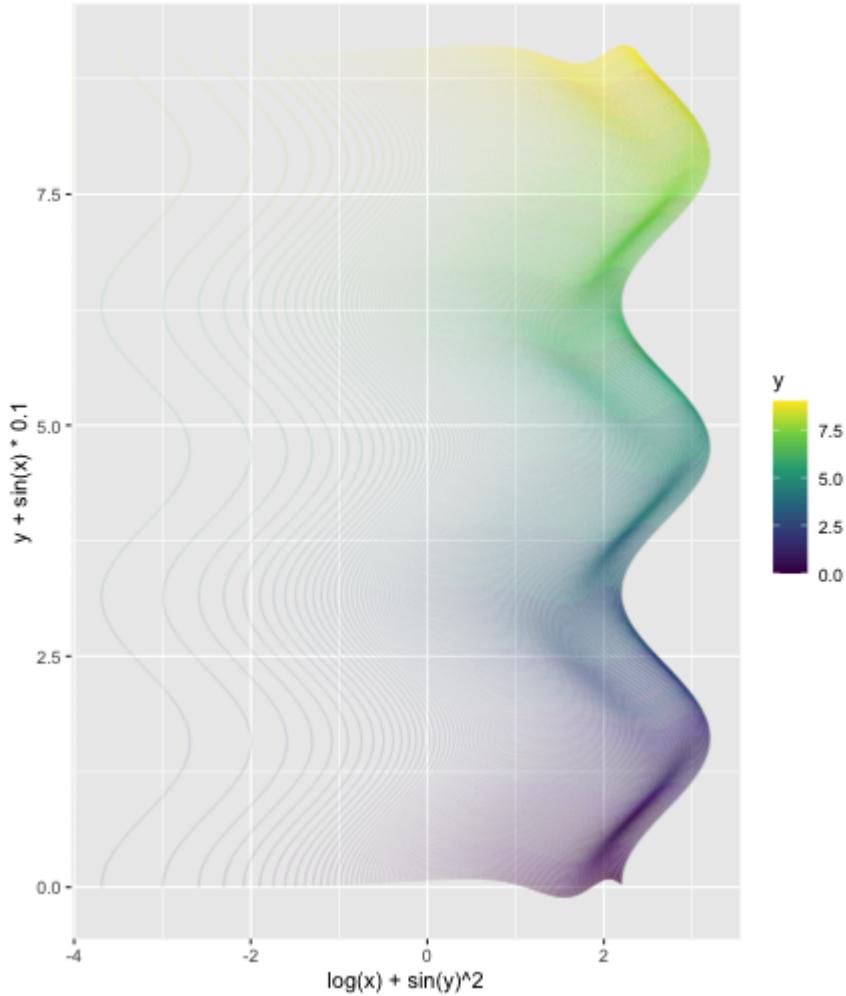


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1)

```

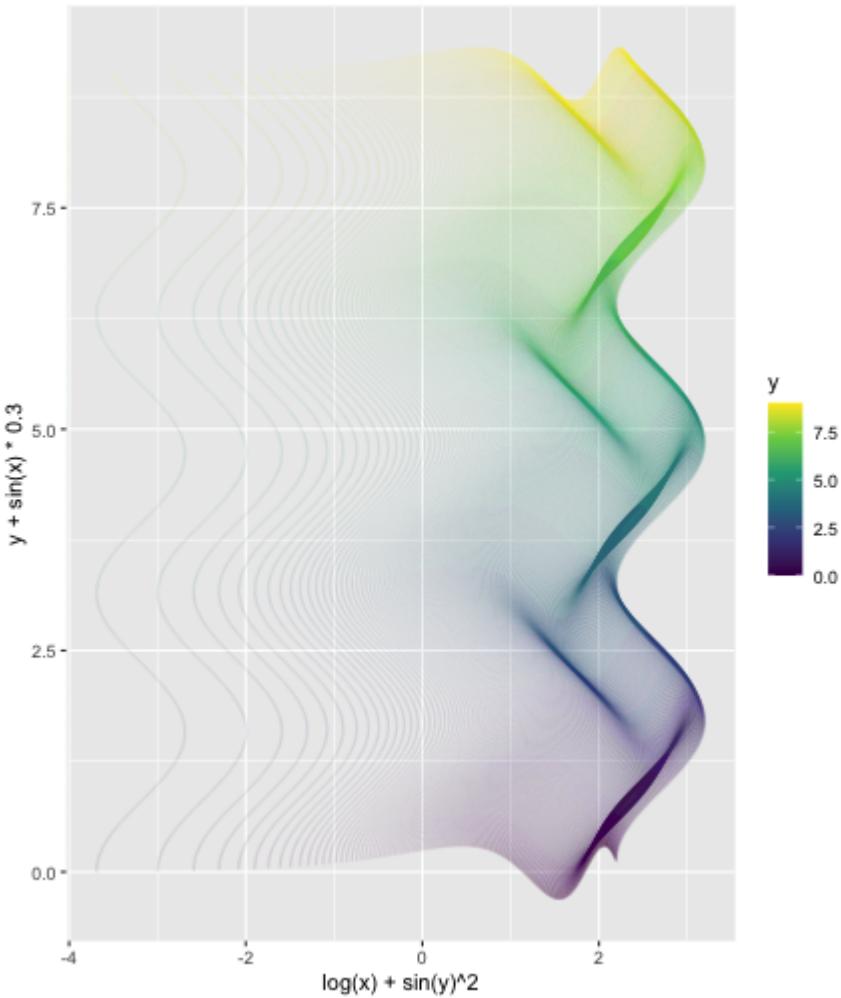


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3)

```

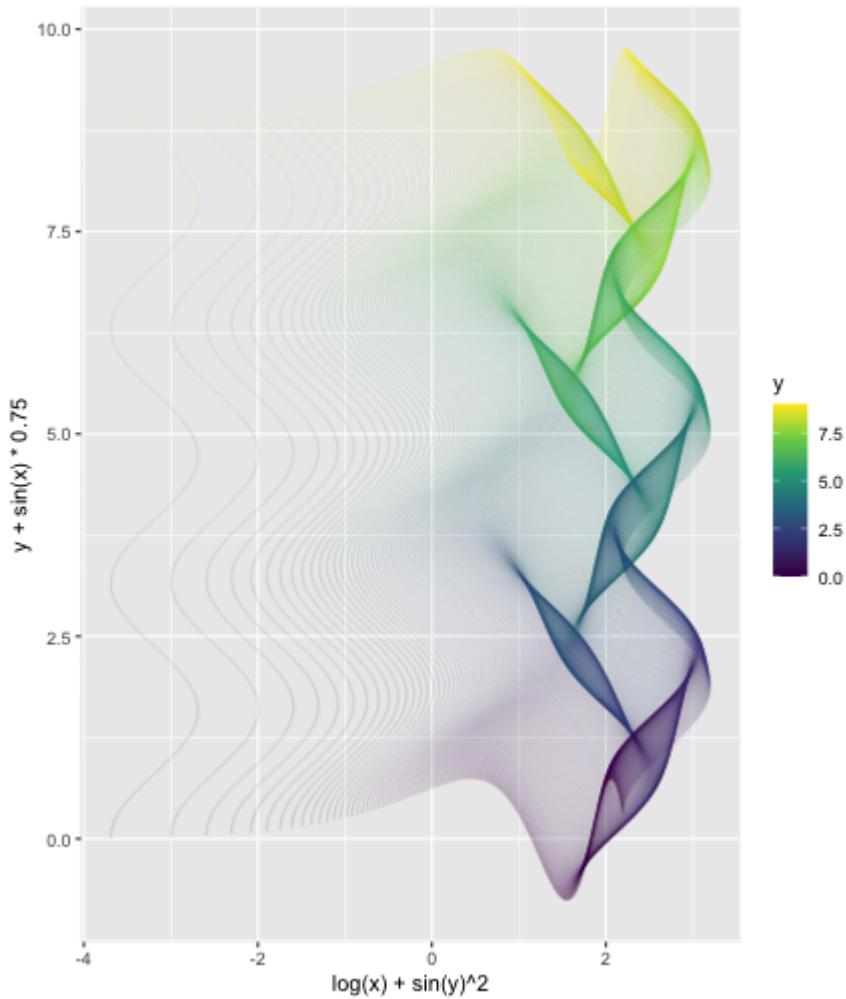


```

seq(0, 9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75)

```

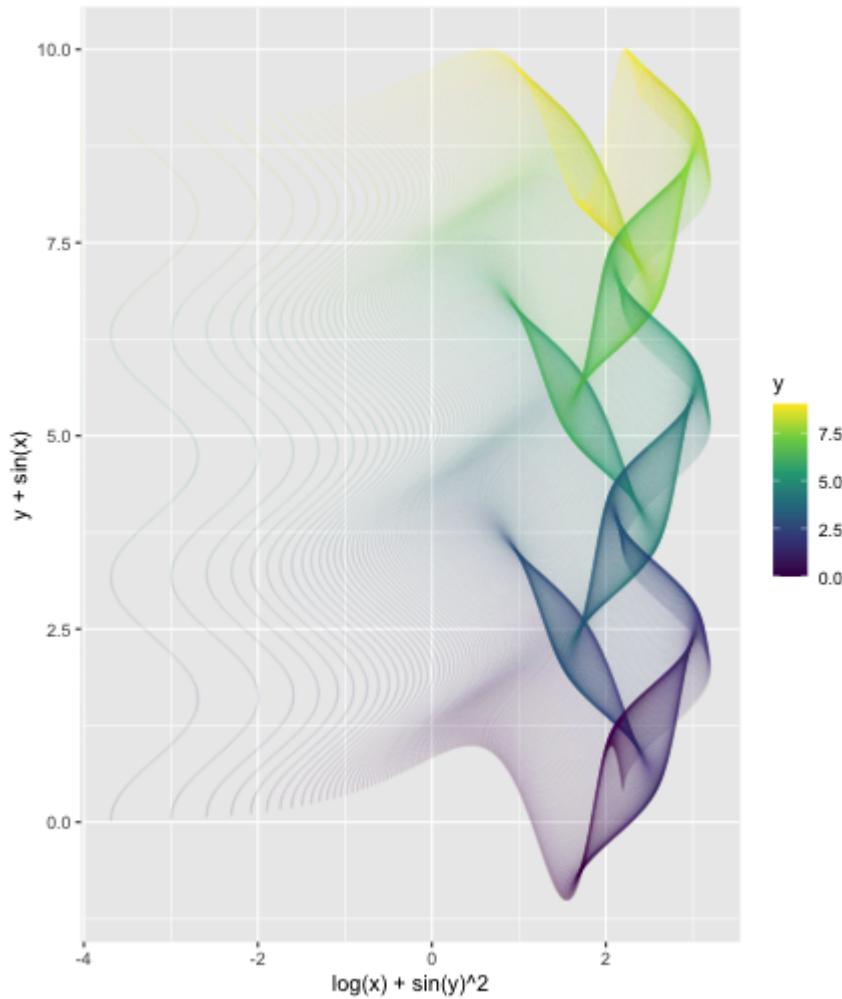


```

seq(0, 9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x))

```

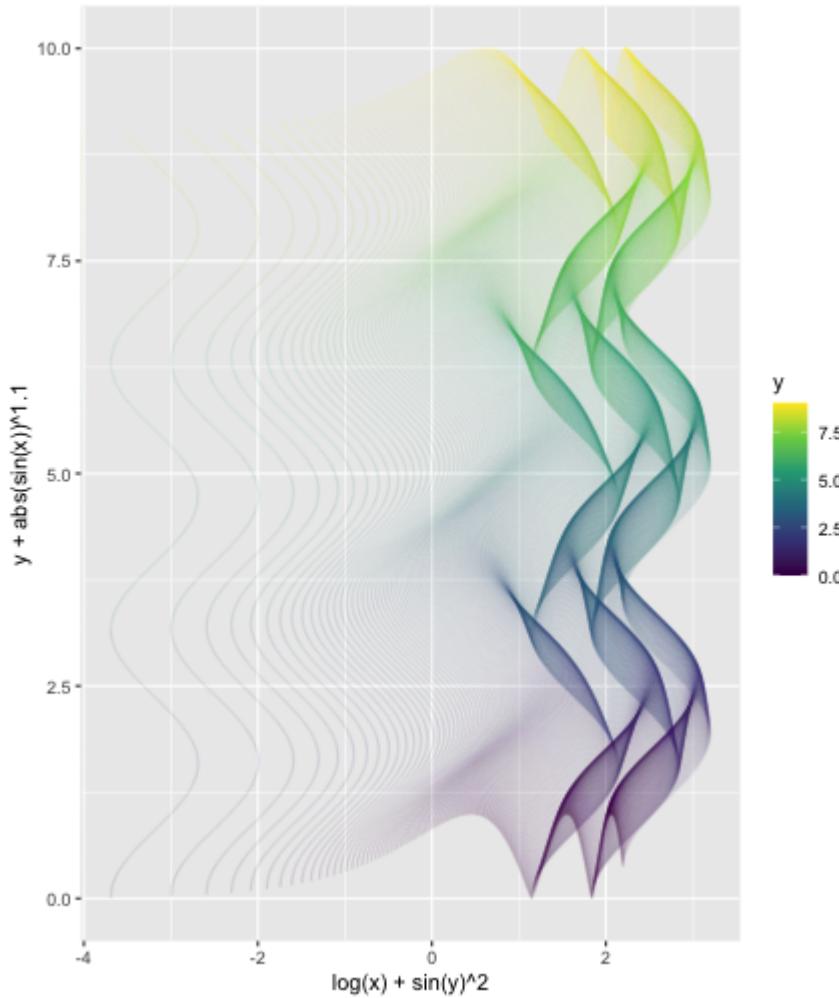


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + abs(sin(x))^1.1)

```

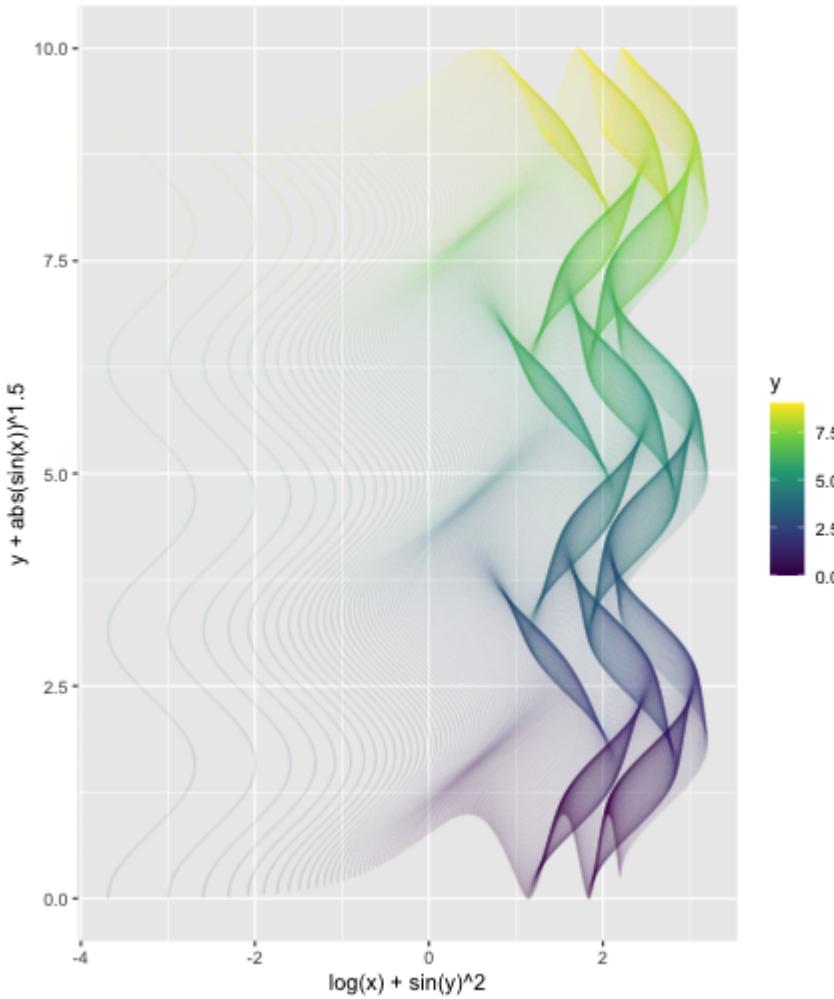


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + abs(sin(x))^1.1) +
  aes(y = y + abs(sin(x))^1.5)

```

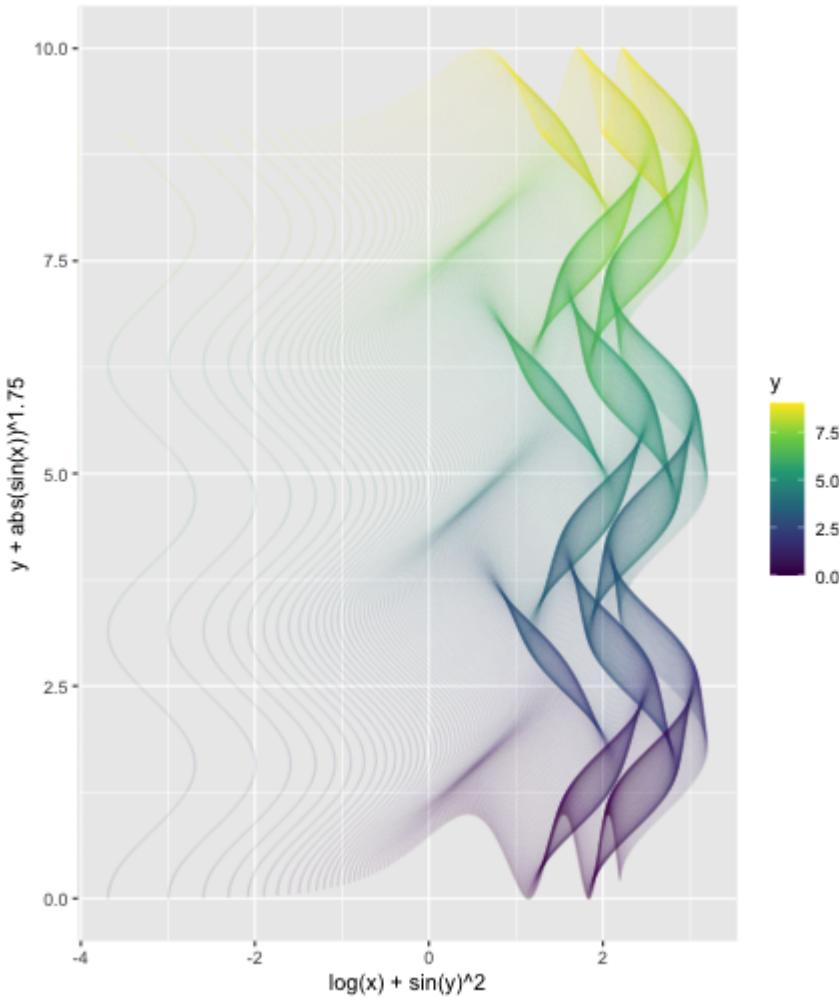


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + abs(sin(x))^1.1) +
  aes(y = y + abs(sin(x))^1.5) +
  aes(y = y + abs(sin(x))^1.75)

```

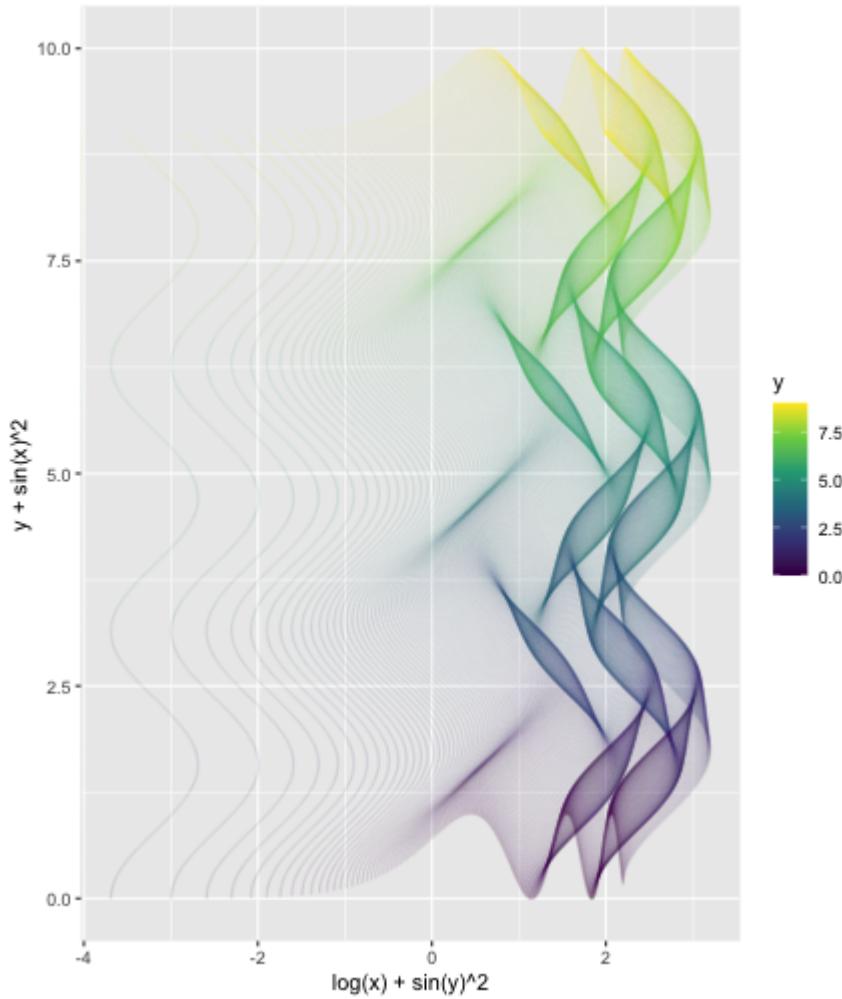


```

seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + abs(sin(x))^1.1) +
  aes(y = y + abs(sin(x))^1.5) +
  aes(y = y + abs(sin(x))^1.75) +
  aes(y = y + sin(x)^2)

```

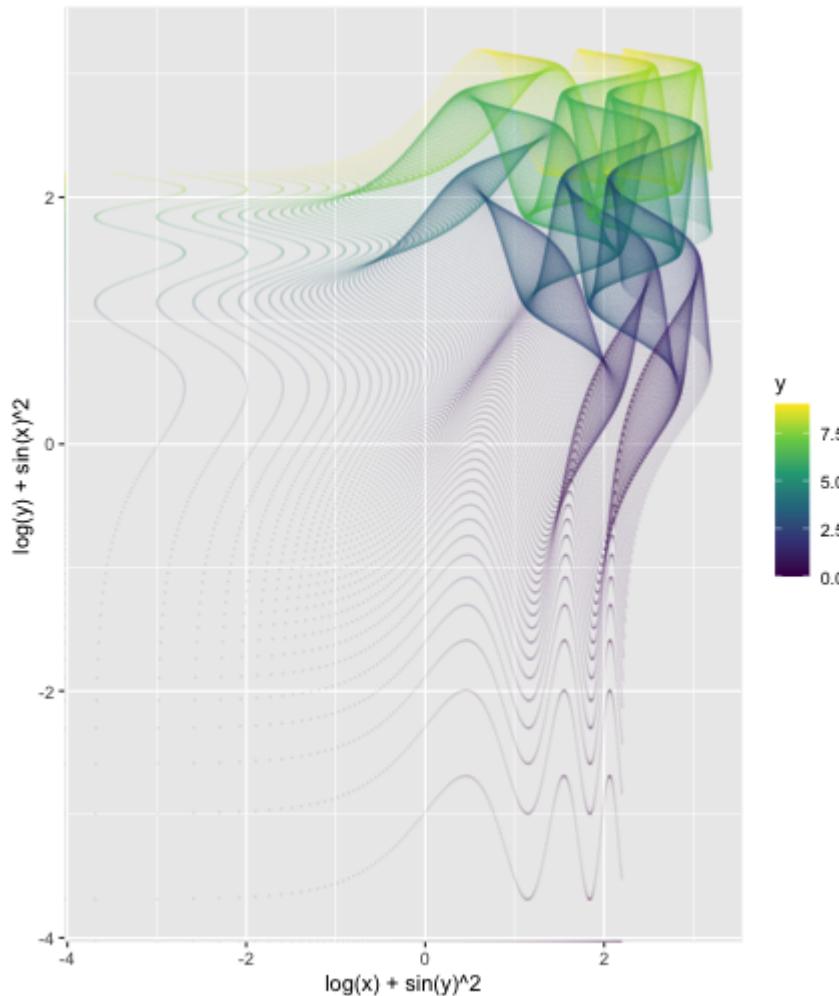


```

seq(0, 9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + abs(sin(x))^1.1) +
  aes(y = y + abs(sin(x))^1.5) +
  aes(y = y + abs(sin(x))^1.75) +
  aes(y = y + sin(x)^2) +
  aes(y = log(y) + sin(x)^2)

```

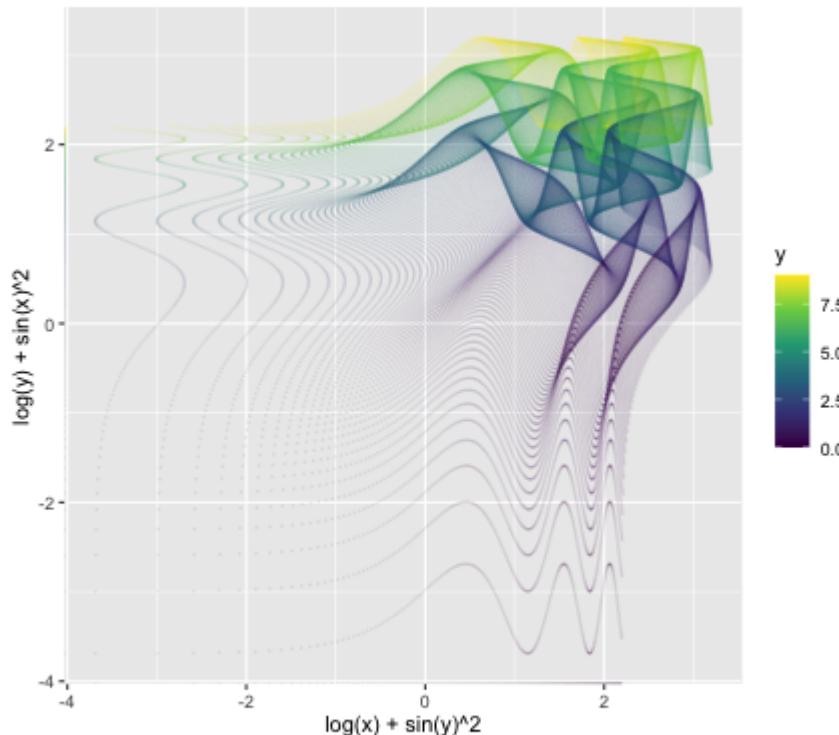


```

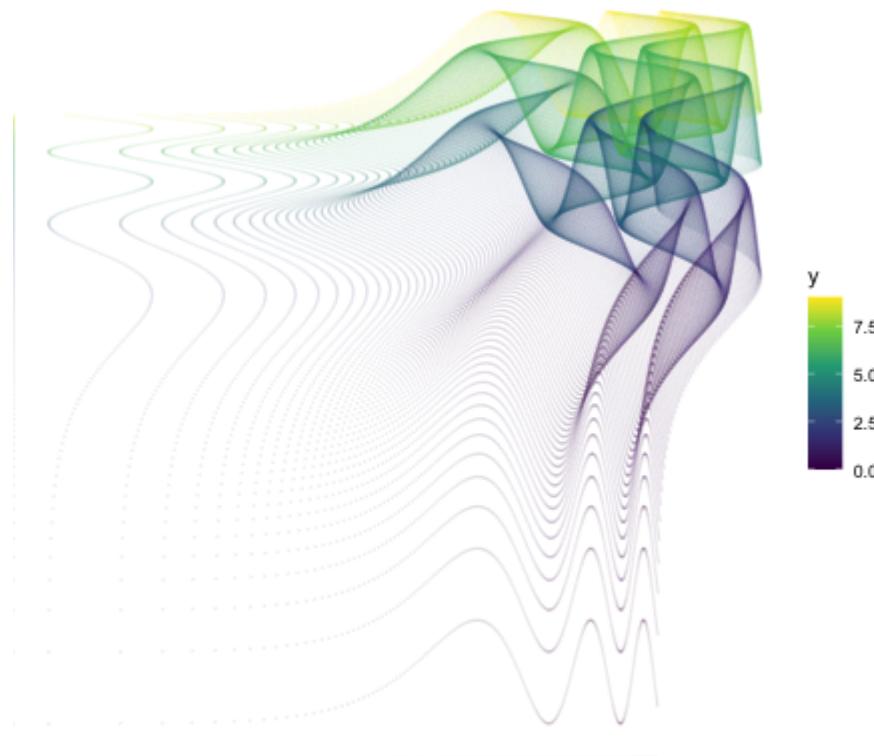
seq(0,9, by = 0.025) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(size = 0, alpha = .05) +
  aes(color = y) +
  aes(alpha = x) +
  scale_color_viridis_c() +
  aes(x = x + sin(y)*.1) +
  aes(x = x + sin(y)*.3) +
  aes(x = x + sin(y)*.75) +
  aes(x = x + sin(y)) +
  aes(x = x + abs(sin(y))^1.1) +
  aes(x = x + abs(sin(y))^1.5) +
  aes(x = x + abs(sin(y))^1.75) +
  aes(x = x + sin(y)^2) +
  aes(x = log(x) + sin(y)^2) +
  aes(y = y + sin(x)*.1) +
  aes(y = y + sin(x)*.3) +
  aes(y = y + sin(x)*.75) +
  aes(y = y + sin(x)) +
  aes(y = y + abs(sin(x))^1.1) +
  aes(y = y + abs(sin(x))^1.5) +
  aes(y = y + abs(sin(x))^1.75) +
  aes(y = y + sin(x)^2) +
  aes(y = log(y) + sin(x)^2) +
  coord_equal()

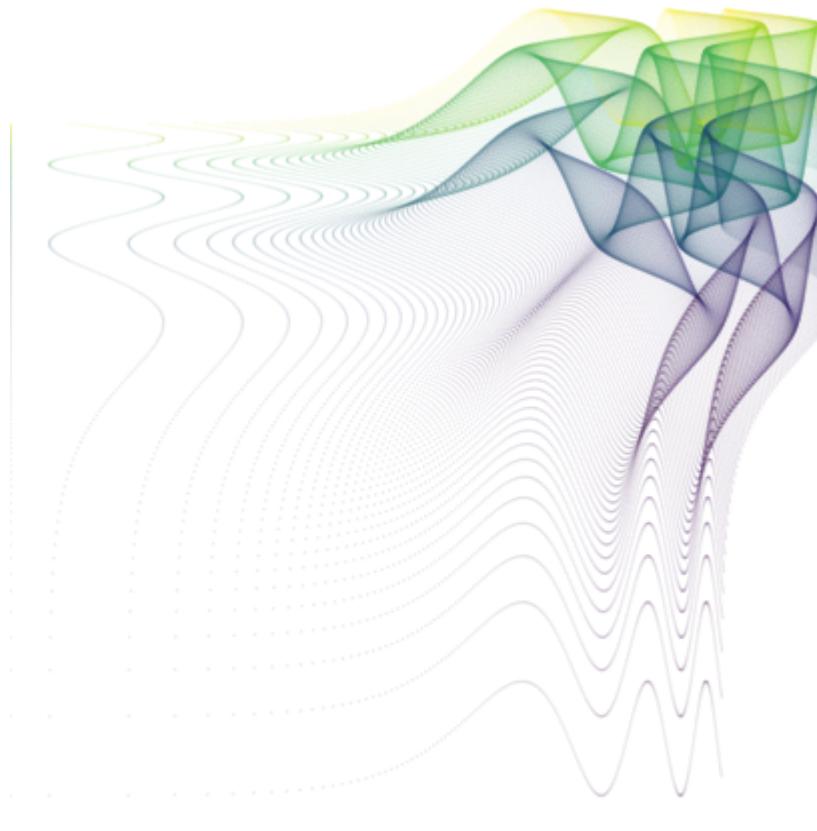
```



```
seq(0, 9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(size = 0, alpha = .05) +  
  aes(color = y) +  
  aes(alpha = x) +  
  scale_color_viridis_c() +  
  aes(x = x + sin(y)*.1) +  
  aes(x = x + sin(y)*.3) +  
  aes(x = x + sin(y)*.75) +  
  aes(x = x + sin(y)) +  
  aes(x = x + abs(sin(y))^1.1) +  
  aes(x = x + abs(sin(y))^1.5) +  
  aes(x = x + abs(sin(y))^1.75) +  
  aes(x = x + sin(y)^2) +  
  aes(x = log(x) + sin(y)^2) +  
  aes(y = y + sin(x)*.1) +  
  aes(y = y + sin(x)*.3) +  
  aes(y = y + sin(x)*.75) +  
  aes(y = y + sin(x)) +  
  aes(y = y + abs(sin(x))^1.1) +  
  aes(y = y + abs(sin(x))^1.5) +  
  aes(y = y + abs(sin(x))^1.75) +  
  aes(y = y + sin(x)^2) +  
  aes(y = log(y) + sin(x)^2) +  
  coord_equal() +  
  theme_void()
```



```
seq(0, 9, by = 0.025) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(size = 0, alpha = .05) +  
  aes(color = y) +  
  aes(alpha = x) +  
  scale_color_viridis_c() +  
  aes(x = x + sin(y)*.1) +  
  aes(x = x + sin(y)*.3) +  
  aes(x = x + sin(y)*.75) +  
  aes(x = x + sin(y)) +  
  aes(x = x + abs(sin(y))^1.1) +  
  aes(x = x + abs(sin(y))^1.5) +  
  aes(x = x + abs(sin(y))^1.75) +  
  aes(x = x + sin(y)^2) +  
  aes(x = log(x) + sin(y)^2) +  
  aes(y = y + sin(x)*.1) +  
  aes(y = y + sin(x)*.3) +  
  aes(y = y + sin(x)*.75) +  
  aes(y = y + sin(x)) +  
  aes(y = y + abs(sin(x))^1.1) +  
  aes(y = y + abs(sin(x))^1.5) +  
  aes(y = y + abs(sin(x))^1.75) +  
  aes(y = y + sin(x)^2) +  
  aes(y = log(y) + sin(x)^2) +  
  coord_equal() +  
  theme_void() +  
  theme(legend.position = "none")
```



another rose



```
seq(-12,12, by = 0.04)
```

```
[1] -12.00 -11.96 -11.92 -11.88 -11.84 -11.80 -11.76 -11.72 -11.68 -11.64  
[11] -11.60 -11.56 -11.52 -11.48 -11.44 -11.40 -11.36 -11.32 -11.28 -11.24  
[21] -11.20 -11.16 -11.12 -11.08 -11.04 -11.00 -10.96 -10.92 -10.88 -10.84  
[31] -10.80 -10.76 -10.72 -10.68 -10.64 -10.60 -10.56 -10.52 -10.48 -10.44  
[41] -10.40 -10.36 -10.32 -10.28 -10.24 -10.20 -10.16 -10.12 -10.08 -10.04  
[51] -10.00 -9.96 -9.92 -9.88 -9.84 -9.80 -9.76 -9.72 -9.68 -9.64  
[61] -9.60 -9.56 -9.52 -9.48 -9.44 -9.40 -9.36 -9.32 -9.28 -9.24  
[71] -9.20 -9.16 -9.12 -9.08 -9.04 -9.00 -8.96 -8.92 -8.88 -8.84  
[81] -8.80 -8.76 -8.72 -8.68 -8.64 -8.60 -8.56 -8.52 -8.48 -8.44  
[91] -8.40 -8.36 -8.32 -8.28 -8.24 -8.20 -8.16 -8.12 -8.08 -8.04  
[101] -8.00 -7.96 -7.92 -7.88 -7.84 -7.80 -7.76 -7.72 -7.68 -7.64  
[111] -7.60 -7.56 -7.52 -7.48 -7.44 -7.40 -7.36 -7.32 -7.28 -7.24  
[121] -7.20 -7.16 -7.12 -7.08 -7.04 -7.00 -6.96 -6.92 -6.88 -6.84  
[131] -6.80 -6.76 -6.72 -6.68 -6.64 -6.60 -6.56 -6.52 -6.48 -6.44  
[141] -6.40 -6.36 -6.32 -6.28 -6.24 -6.20 -6.16 -6.12 -6.08 -6.04  
[151] -6.00 -5.96 -5.92 -5.88 -5.84 -5.80 -5.76 -5.72 -5.68 -5.64  
[161] -5.60 -5.56 -5.52 -5.48 -5.44 -5.40 -5.36 -5.32 -5.28 -5.24  
[171] -5.20 -5.16 -5.12 -5.08 -5.04 -5.00 -4.96 -4.92 -4.88 -4.84  
[181] -4.80 -4.76 -4.72 -4.68 -4.64 -4.60 -4.56 -4.52 -4.48 -4.44  
[191] -4.40 -4.36 -4.32 -4.28 -4.24 -4.20 -4.16 -4.12 -4.08 -4.04  
[201] -4.00 -3.96 -3.92 -3.88 -3.84 -3.80 -3.76 -3.72 -3.68 -3.64  
[211] -3.60 -3.56 -3.52 -3.48 -3.44 -3.40 -3.36 -3.32 -3.28 -3.24  
[221] -3.20 -3.16 -3.12 -3.08 -3.04 -3.00 -2.96 -2.92 -2.88 -2.84  
[231] -2.80 -2.76 -2.72 -2.68 -2.64 -2.60 -2.56 -2.52 -2.48 -2.44  
[241] -2.40 -2.36 -2.32 -2.28 -2.24 -2.20 -2.16 -2.12 -2.08 -2.04  
[251] -2.00 -1.96 -1.92 -1.88 -1.84 -1.80 -1.76 -1.72 -1.68 -1.64  
[261] -1.60 -1.56 -1.52 -1.48 -1.44 -1.40 -1.36 -1.32 -1.28 -1.24  
[271] -1.20 -1.16 -1.12 -1.08 -1.04 -1.00 -0.96 -0.92 -0.88 -0.84  
[281] -0.80 -0.76 -0.72 -0.68 -0.64 -0.60 -0.56 -0.52 -0.48 -0.44  
[291] -0.40 -0.36 -0.32 -0.28 -0.24 -0.20 -0.16 -0.12 -0.08 -0.04  
[301] 0.00 0.04 0.08 0.12 0.16 0.20 0.24 0.28 0.32 0.36  
[311] 0.40 0.44 0.48 0.52 0.56 0.60 0.64 0.68 0.72 0.76  
[321] 0.80 0.84 0.88 0.92 0.96 1.00 1.04 1.08 1.12 1.16
```

```
seq(-12,12, by = 0.04) ->  
my_seq
```

```
seq(-12,12, by = 0.04) ->  
my_seq  
tibble(x = my_seq)
```

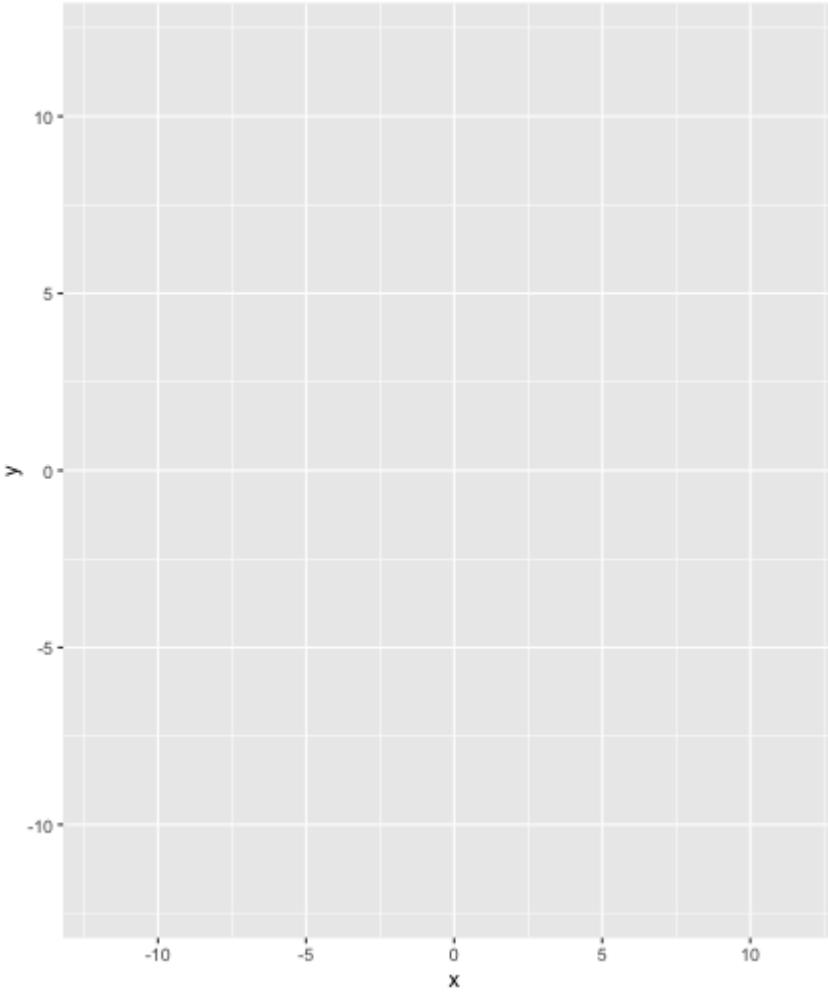
```
# A tibble: 601 x 1  
      x  
     <dbl>  
1  -12  
2  -12.0  
3  -11.9  
4  -11.9  
5  -11.8  
6  -11.8  
7  -11.8  
8  -11.7  
9  -11.7  
10 -11.6  
# ... with 591 more rows
```

```
seq(-12,12, by = 0.04) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq)
```

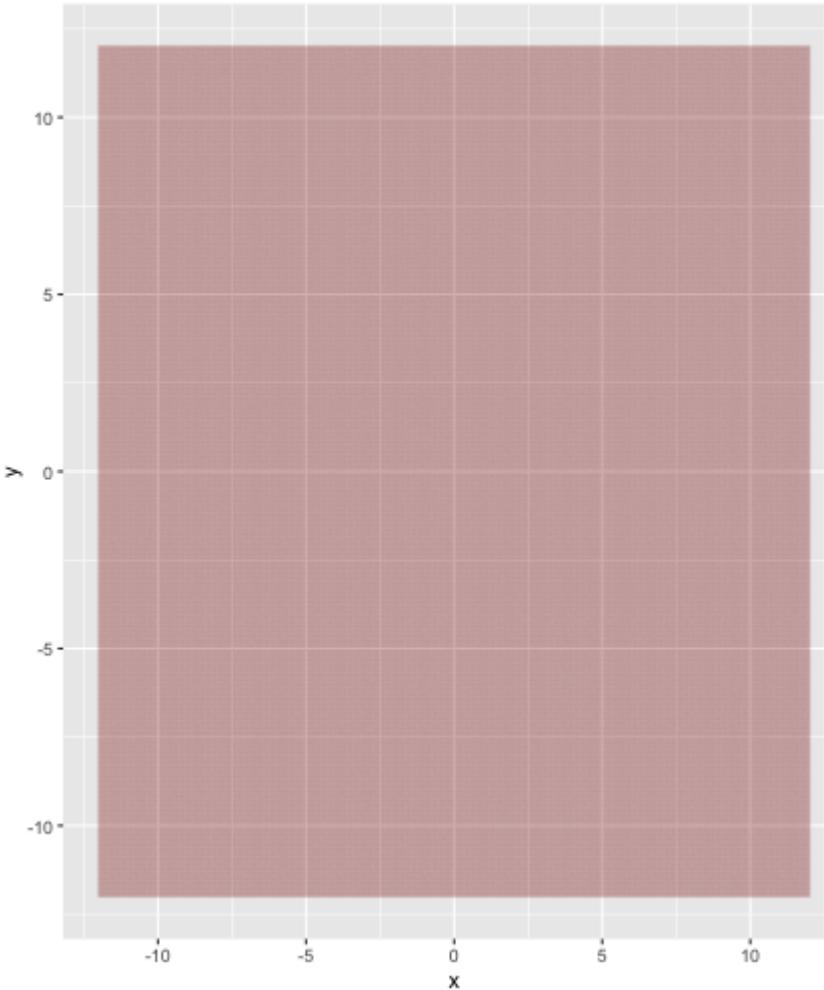
# A tibble: 361,201 x 2  
 x y  
 <dbl> <dbl>  
1 -12 -12  
2 -12 -12.0  
3 -12 -11.9  
4 -12 -11.9  
5 -12 -11.8  
6 -12 -11.8  
7 -12 -11.8  
8 -12 -11.7  
9 -12 -11.7  
10 -12 -11.6  
# ... with 361,191 more rows

```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot()
```

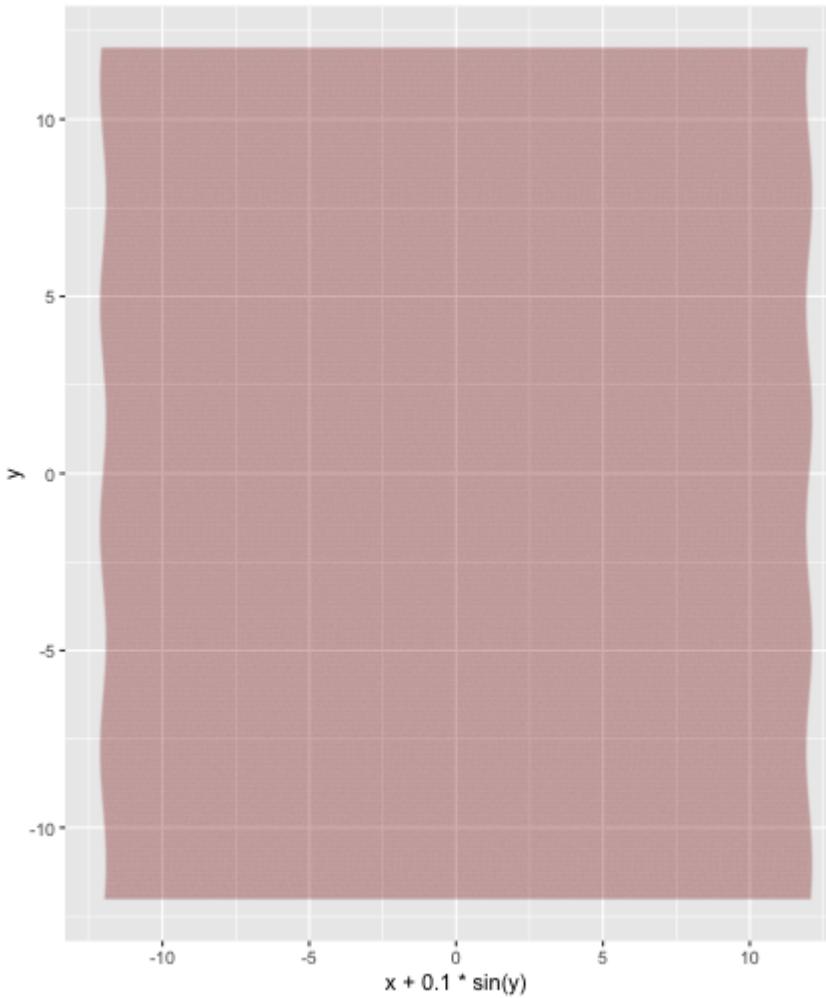
```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y)
```



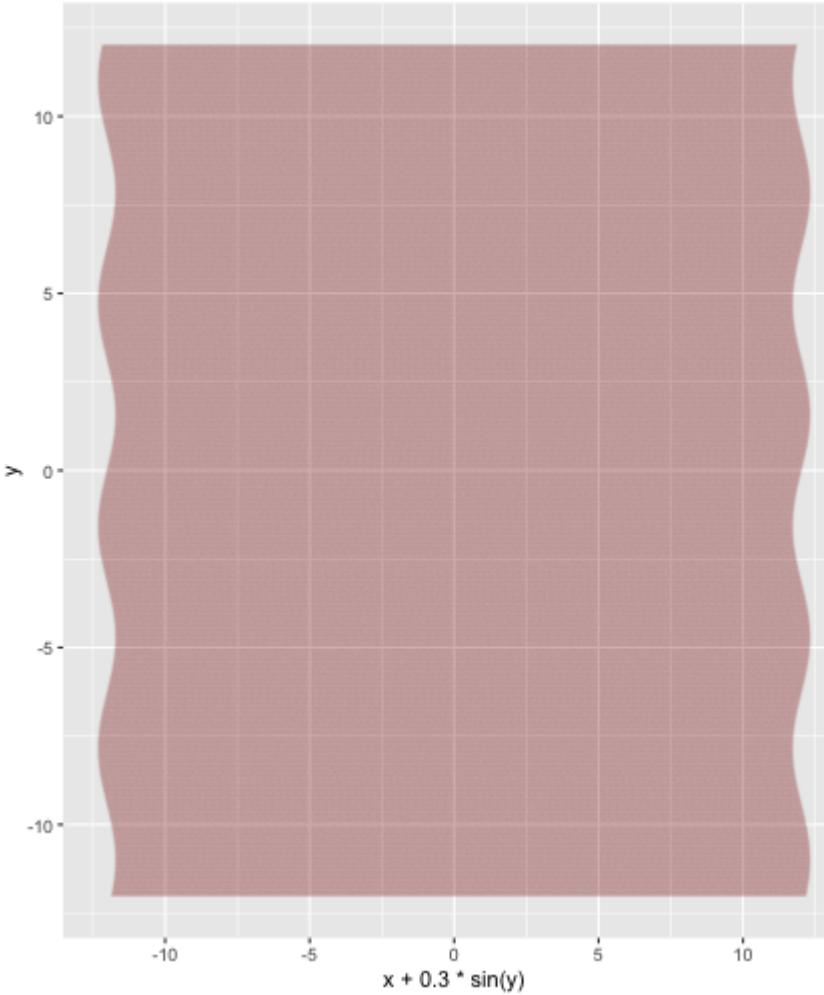
```
seq(-12,12, by = 0.04) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(alpha = 0.05,  
             color = "darkred",  
             size = 0)
```



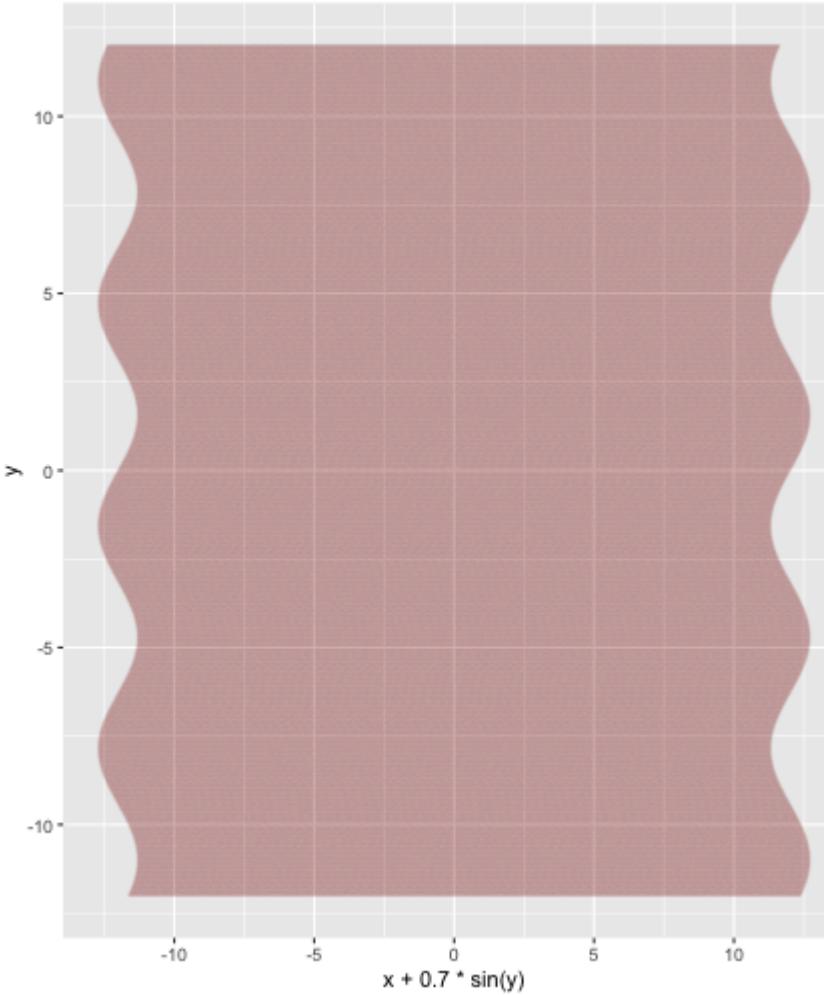
```
seq(-12,12, by = 0.04) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(alpha = 0.05,  
             color = "darkred",  
             size = 0) +  
  aes(x = x + .1 * sin(y))
```



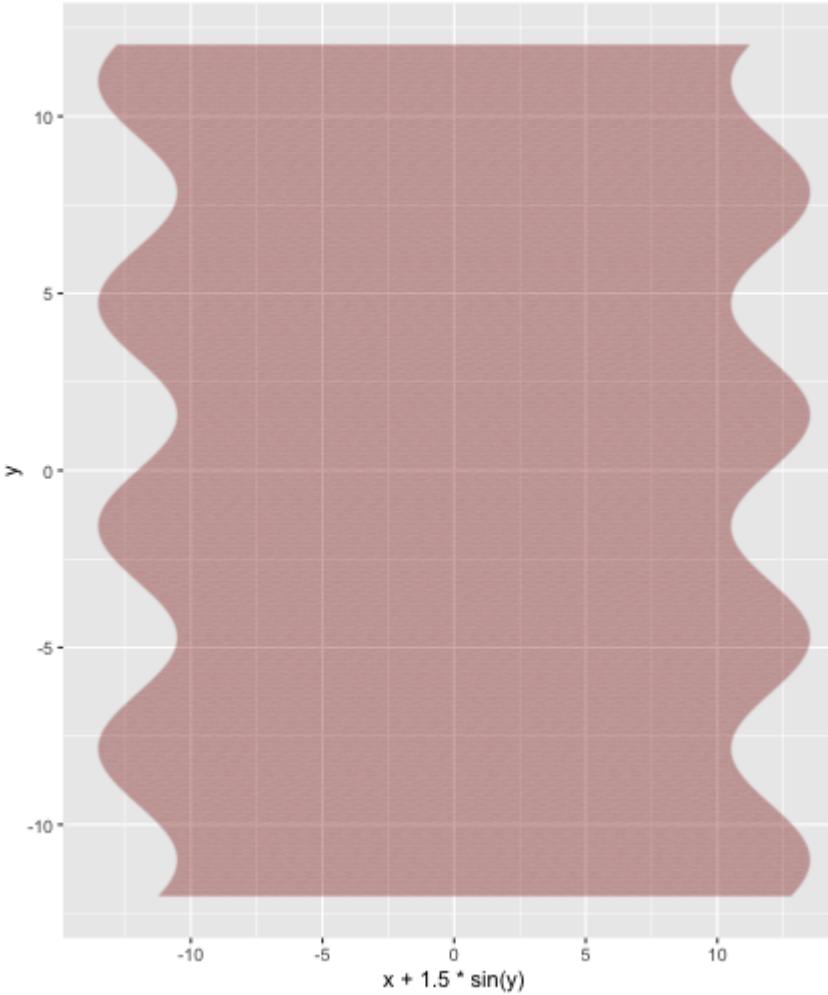
```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
color = "darkred",  
size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y))
```



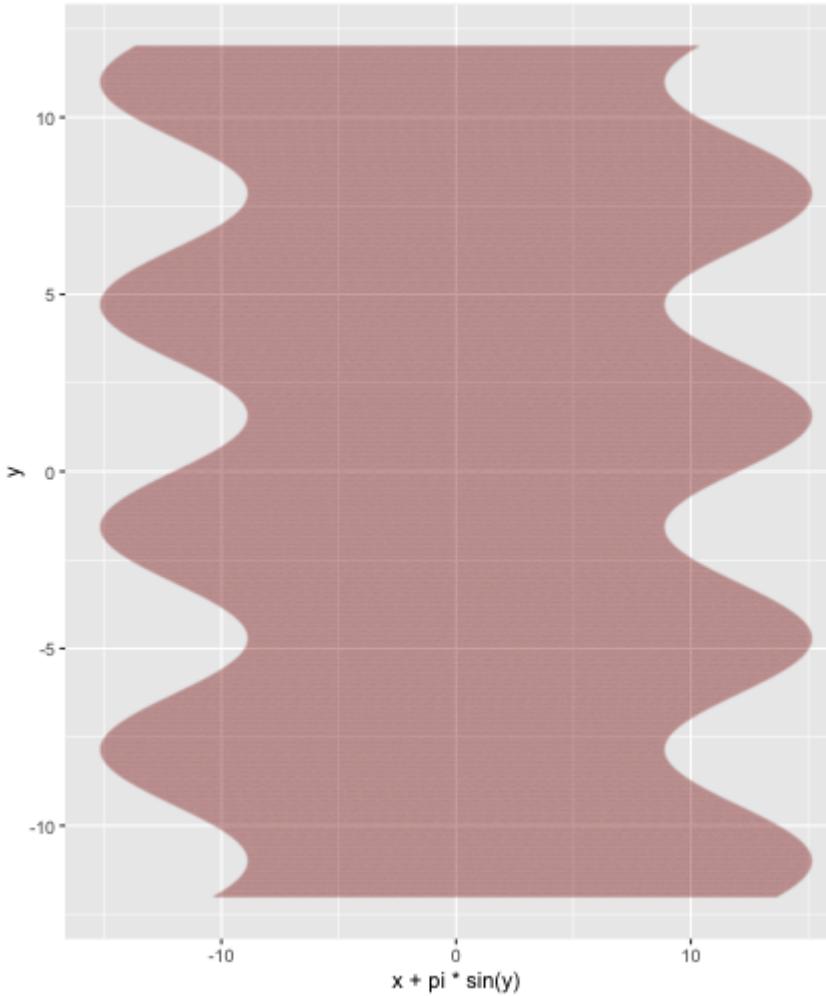
```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
color = "darkred",  
size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y))
```



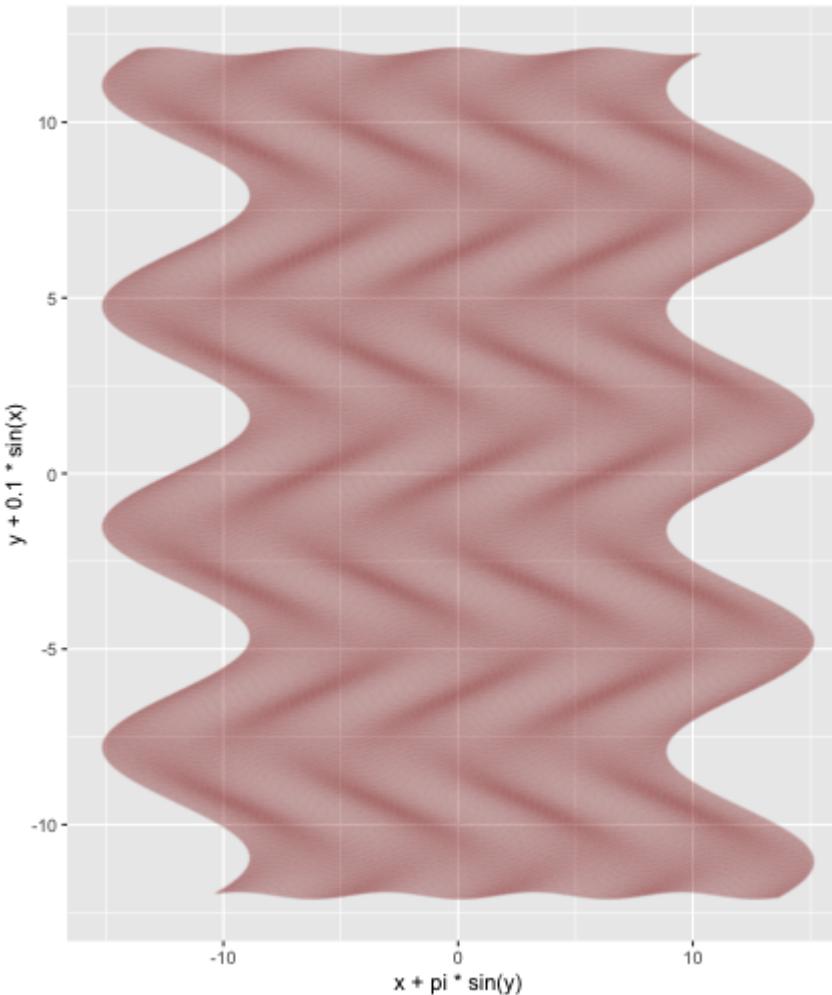
```
seq(-12,12, by = 0.04) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(alpha = 0.05,  
             color = "darkred",  
             size = 0) +  
  aes(x = x + .1 * sin(y)) +  
  aes(x = x + .3 * sin(y)) +  
  aes(x = x + .7 * sin(y)) +  
  aes(x = x + 1.5 * sin(y))
```



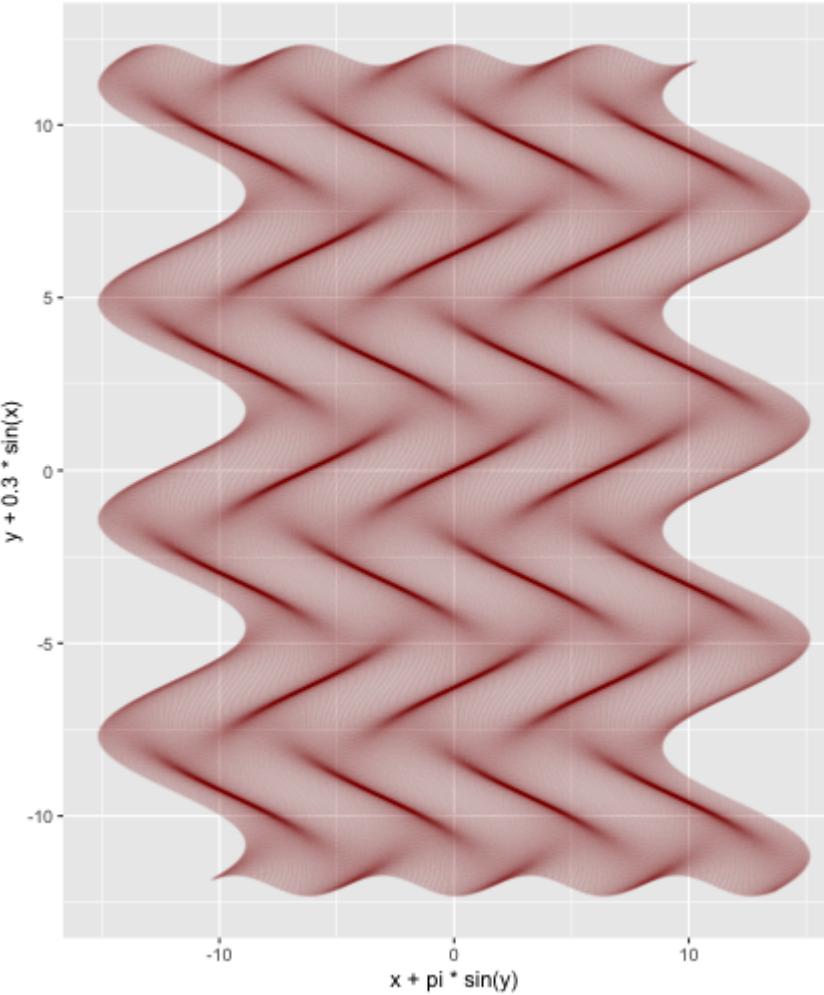
```
seq(-12,12, by = 0.04) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(alpha = 0.05,  
             color = "darkred",  
             size = 0) +  
  aes(x = x + .1 * sin(y)) +  
  aes(x = x + .3 * sin(y)) +  
  aes(x = x + .7 * sin(y)) +  
  aes(x = x + 1.5 * sin(y)) +  
  aes(x = x + pi * sin(y))
```



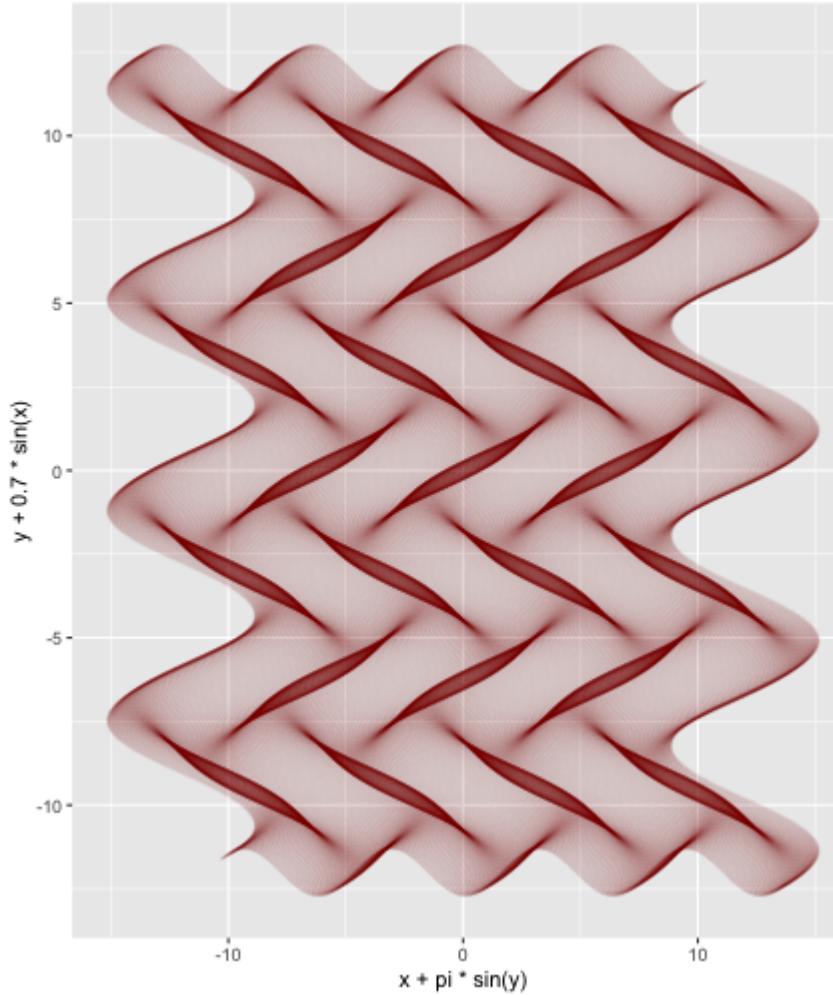
```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x))
```



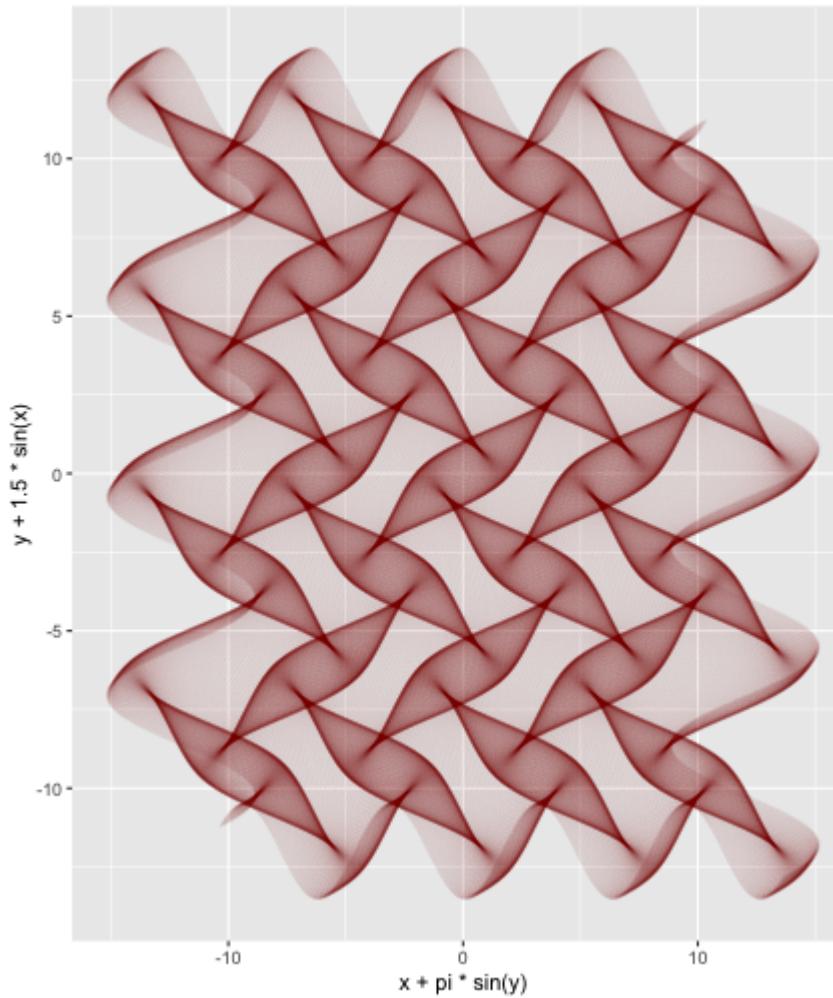
```
seq(-12,12, by = 0.04) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x, y = y) +  
  geom_point(alpha = 0.05,  
             color = "darkred",  
             size = 0) +  
  aes(x = x + .1 * sin(y)) +  
  aes(x = x + .3 * sin(y)) +  
  aes(x = x + .7 * sin(y)) +  
  aes(x = x + 1.5 * sin(y)) +  
  aes(x = x + pi * sin(y)) +  
  aes(y = y + .1 * sin(x)) +  
  aes(y = y + .3 * sin(x))
```



```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x))
```



```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x)) +  
aes(y = y + 1.5 * sin(x))
```

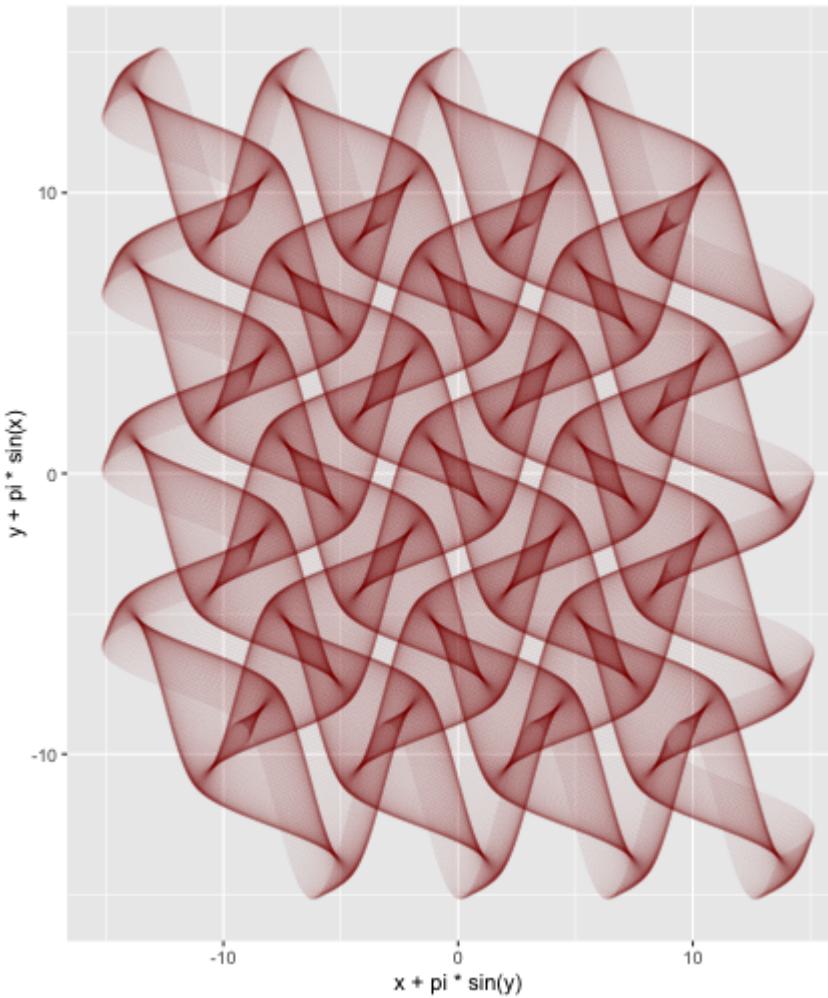


```

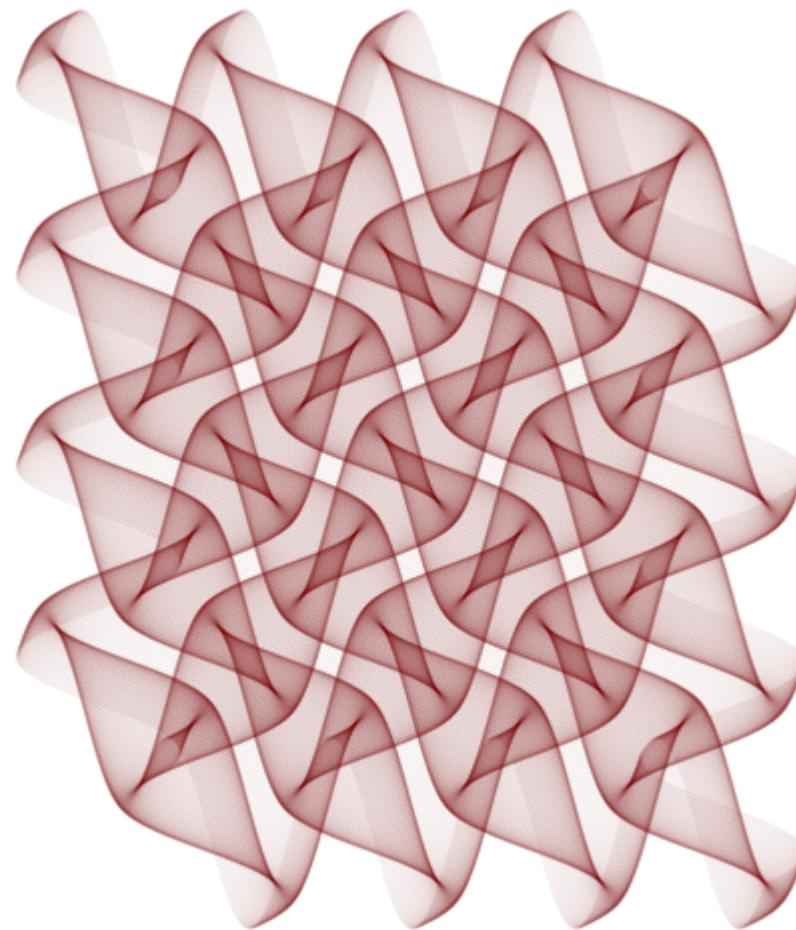
seq(-12,12, by = 0.04) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(alpha = 0.05,
             color = "darkred",
             size = 0) +
  aes(x = x + .1 * sin(y)) +
  aes(x = x + .3 * sin(y)) +
  aes(x = x + .7 * sin(y)) +
  aes(x = x + 1.5 * sin(y)) +
  aes(x = x + pi * sin(y)) +
  aes(y = y + .1 * sin(x)) +
  aes(y = y + .3 * sin(x)) +
  aes(y = y + .7 * sin(x)) +
  aes(y = y + 1.5 * sin(x)) +
  aes(y = y + pi * sin(x))

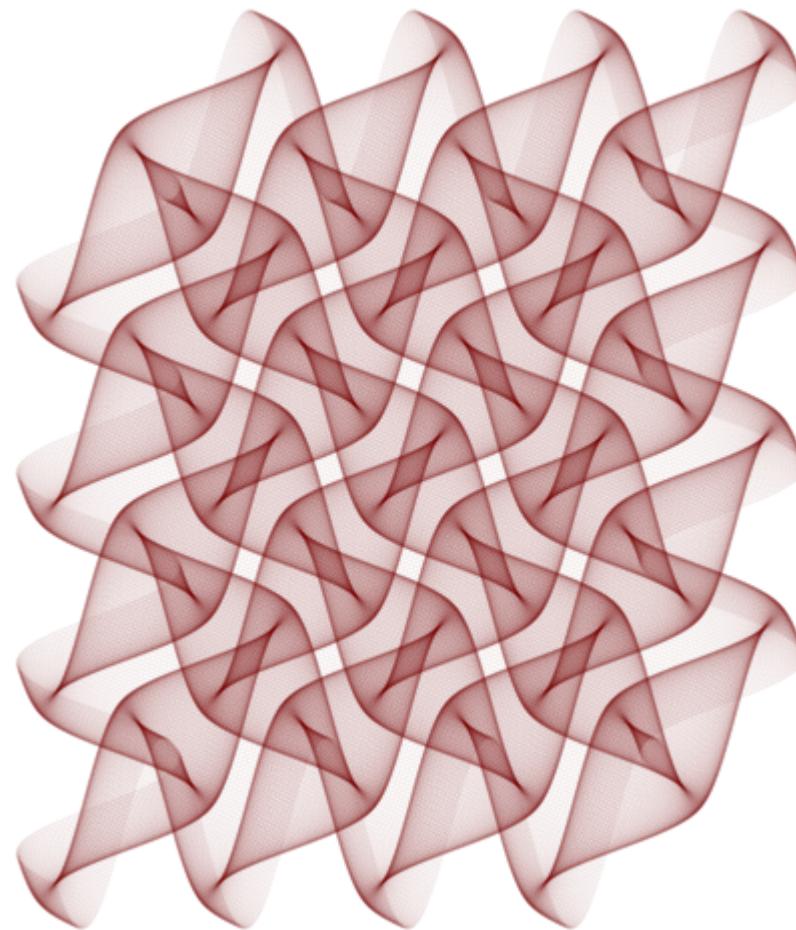
```



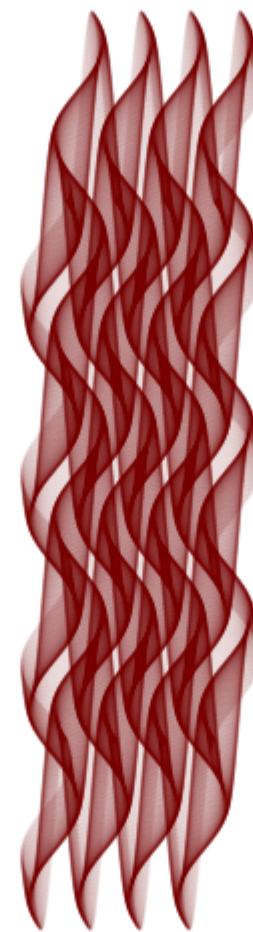
```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x)) +  
aes(y = y + 1.5 * sin(x)) +  
aes(y = y + pi * sin(x)) +  
theme_void()
```



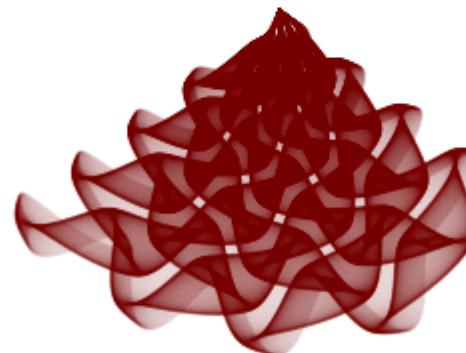
```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x)) +  
aes(y = y + 1.5 * sin(x)) +  
aes(y = y + pi * sin(x)) +  
theme_void() +  
scale_y_reverse()
```



```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x)) +  
aes(y = y + 1.5 * sin(x)) +  
aes(y = y + pi * sin(x)) +  
theme_void() +  
scale_y_reverse() +  
scale_x_continuous(limits = c(-50, 50))
```

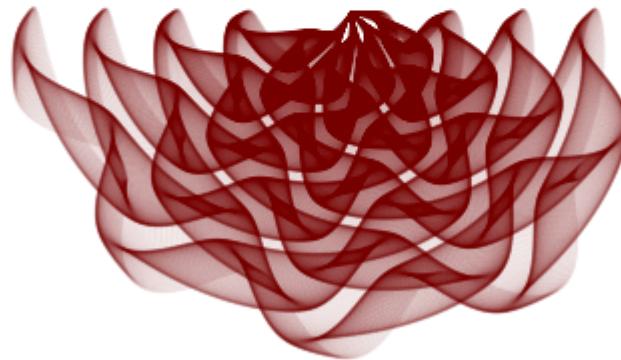


```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x)) +  
aes(y = y + 1.5 * sin(x)) +  
aes(y = y + pi * sin(x)) +  
theme_void() +  
scale_y_reverse() +  
scale_x_continuous(limits = c(-50, 50)) +  
coord_polar()
```



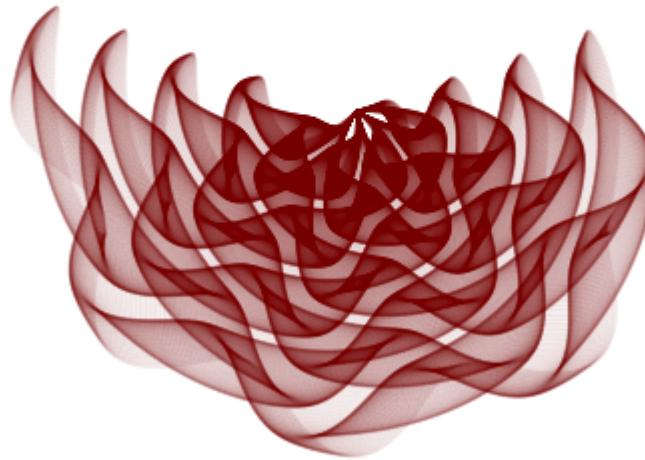
```
seq(-12,12, by = 0.04) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(alpha = 0.05,
             color = "darkred",
             size = 0) +
  aes(x = x + .1 * sin(y)) +
  aes(x = x + .3 * sin(y)) +
  aes(x = x + .7 * sin(y)) +
  aes(x = x + 1.5 * sin(y)) +
  aes(x = x + pi * sin(y)) +
  aes(y = y + .1 * sin(x)) +
  aes(y = y + .3 * sin(x)) +
  aes(y = y + .7 * sin(x)) +
  aes(y = y + 1.5 * sin(x)) +
  aes(y = y + pi * sin(x)) +
  theme_void() +
  scale_y_reverse() +
  scale_x_continuous(limits = c(-50, 50)) +
  coord_polar() +
  scale_x_continuous(limits = c(-30, 30))
```



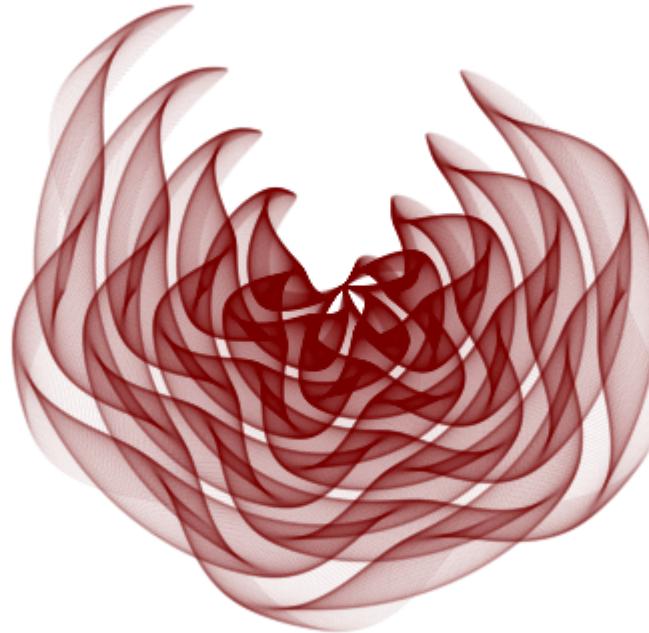
```
seq(-12,12, by = 0.04) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(alpha = 0.05,
             color = "darkred",
             size = 0) +
  aes(x = x + .1 * sin(y)) +
  aes(x = x + .3 * sin(y)) +
  aes(x = x + .7 * sin(y)) +
  aes(x = x + 1.5 * sin(y)) +
  aes(x = x + pi * sin(y)) +
  aes(y = y + .1 * sin(x)) +
  aes(y = y + .3 * sin(x)) +
  aes(y = y + .7 * sin(x)) +
  aes(y = y + 1.5 * sin(x)) +
  aes(y = y + pi * sin(x)) +
  theme_void() +
  scale_y_reverse() +
  scale_x_continuous(limits = c(-50, 50)) +
  coord_polar() +
  scale_x_continuous(limits = c(-30, 30)) +
  scale_x_continuous(limits = c(-25, 25))
```

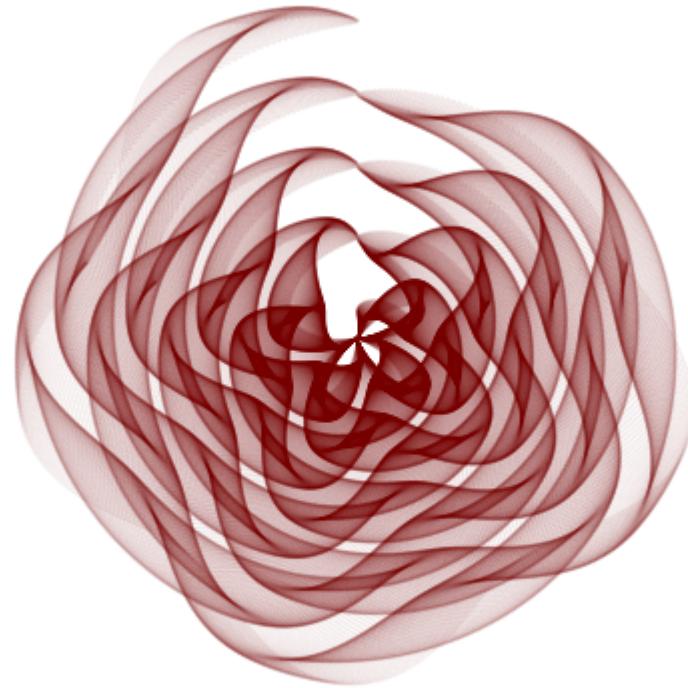


```
seq(-12,12, by = 0.04) ->
  my_seq

tibble(x = my_seq) %>%
  crossing(y = my_seq) %>%
  ggplot() +
  aes(x = x, y = y) +
  geom_point(alpha = 0.05,
             color = "darkred",
             size = 0) +
  aes(x = x + .1 * sin(y)) +
  aes(x = x + .3 * sin(y)) +
  aes(x = x + .7 * sin(y)) +
  aes(x = x + 1.5 * sin(y)) +
  aes(x = x + pi * sin(y)) +
  aes(y = y + .1 * sin(x)) +
  aes(y = y + .3 * sin(x)) +
  aes(y = y + .7 * sin(x)) +
  aes(y = y + 1.5 * sin(x)) +
  aes(y = y + pi * sin(x)) +
  theme_void() +
  scale_y_reverse() +
  scale_x_continuous(limits = c(-50, 50)) +
  coord_polar() +
  scale_x_continuous(limits = c(-30, 30)) +
  scale_x_continuous(limits = c(-25, 25)) +
  scale_x_continuous(limits = c(-18, 18))
```



```
seq(-12,12, by = 0.04) ->  
my_seq  
  
tibble(x = my_seq) %>%  
crossing(y = my_seq) %>%  
ggplot() +  
aes(x = x, y = y) +  
geom_point(alpha = 0.05,  
           color = "darkred",  
           size = 0) +  
aes(x = x + .1 * sin(y)) +  
aes(x = x + .3 * sin(y)) +  
aes(x = x + .7 * sin(y)) +  
aes(x = x + 1.5 * sin(y)) +  
aes(x = x + pi * sin(y)) +  
aes(y = y + .1 * sin(x)) +  
aes(y = y + .3 * sin(x)) +  
aes(y = y + .7 * sin(x)) +  
aes(y = y + 1.5 * sin(x)) +  
aes(y = y + pi * sin(x)) +  
theme_void() +  
scale_y_reverse() +  
scale_x_continuous(limits = c(-50, 50)) +  
coord_polar() +  
scale_x_continuous(limits = c(-30, 30)) +  
scale_x_continuous(limits = c(-25, 25)) +  
scale_x_continuous(limits = c(-18, 18)) +  
scale_x_continuous()
```



## Dandalion: One less deconstructed

```
seq(-2,2, by = 0.01)
```

```
[1] -2.00 -1.99 -1.98 -1.97 -1.96 -1.95 -1.94 -1.93 -1.92 -1.91 -1.90 -1.89  
[13] -1.88 -1.87 -1.86 -1.85 -1.84 -1.83 -1.82 -1.81 -1.80 -1.79 -1.78 -1.77  
[25] -1.76 -1.75 -1.74 -1.73 -1.72 -1.71 -1.70 -1.69 -1.68 -1.67 -1.66 -1.65  
[37] -1.64 -1.63 -1.62 -1.61 -1.60 -1.59 -1.58 -1.57 -1.56 -1.55 -1.54 -1.53  
[49] -1.52 -1.51 -1.50 -1.49 -1.48 -1.47 -1.46 -1.45 -1.44 -1.43 -1.42 -1.41  
[61] -1.40 -1.39 -1.38 -1.37 -1.36 -1.35 -1.34 -1.33 -1.32 -1.31 -1.30 -1.29  
[73] -1.28 -1.27 -1.26 -1.25 -1.24 -1.23 -1.22 -1.21 -1.20 -1.19 -1.18 -1.17  
[85] -1.16 -1.15 -1.14 -1.13 -1.12 -1.11 -1.10 -1.09 -1.08 -1.07 -1.06 -1.05  
[97] -1.04 -1.03 -1.02 -1.01 -1.00 -0.99 -0.98 -0.97 -0.96 -0.95 -0.94 -0.93  
[109] -0.92 -0.91 -0.90 -0.89 -0.88 -0.87 -0.86 -0.85 -0.84 -0.83 -0.82 -0.81  
[121] -0.80 -0.79 -0.78 -0.77 -0.76 -0.75 -0.74 -0.73 -0.72 -0.71 -0.70 -0.69  
[133] -0.68 -0.67 -0.66 -0.65 -0.64 -0.63 -0.62 -0.61 -0.60 -0.59 -0.58 -0.57  
[145] -0.56 -0.55 -0.54 -0.53 -0.52 -0.51 -0.50 -0.49 -0.48 -0.47 -0.46 -0.45  
[157] -0.44 -0.43 -0.42 -0.41 -0.40 -0.39 -0.38 -0.37 -0.36 -0.35 -0.34 -0.33  
[169] -0.32 -0.31 -0.30 -0.29 -0.28 -0.27 -0.26 -0.25 -0.24 -0.23 -0.22 -0.21  
[181] -0.20 -0.19 -0.18 -0.17 -0.16 -0.15 -0.14 -0.13 -0.12 -0.11 -0.10 -0.09  
[193] -0.08 -0.07 -0.06 -0.05 -0.04 -0.03 -0.02 -0.01 0.00 0.01 0.02 0.03  
[205] 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14 0.15  
[217] 0.16 0.17 0.18 0.19 0.20 0.21 0.22 0.23 0.24 0.25 0.26 0.27  
[229] 0.28 0.29 0.30 0.31 0.32 0.33 0.34 0.35 0.36 0.37 0.38 0.39  
[241] 0.40 0.41 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49 0.50 0.51  
[253] 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.60 0.61 0.62 0.63  
[265] 0.64 0.65 0.66 0.67 0.68 0.69 0.70 0.71 0.72 0.73 0.74 0.75  
[277] 0.76 0.77 0.78 0.79 0.80 0.81 0.82 0.83 0.84 0.85 0.86 0.87  
[289] 0.88 0.89 0.90 0.91 0.92 0.93 0.94 0.95 0.96 0.97 0.98 0.99  
[301] 1.00 1.01 1.02 1.03 1.04 1.05 1.06 1.07 1.08 1.09 1.10 1.11  
[313] 1.12 1.13 1.14 1.15 1.16 1.17 1.18 1.19 1.20 1.21 1.22 1.23  
[325] 1.24 1.25 1.26 1.27 1.28 1.29 1.30 1.31 1.32 1.33 1.34 1.35  
[337] 1.36 1.37 1.38 1.39 1.40 1.41 1.42 1.43 1.44 1.45 1.46 1.47  
[349] 1.48 1.49 1.50 1.51 1.52 1.53 1.54 1.55 1.56 1.57 1.58 1.59 125/12
```

## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
my_seq
```

## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->
  my_seq
tibble(x = my_seq)
```

```
# A tibble: 401 x 1
#>   x
#>   <dbl>
#> 1 -2
#> 2 -1.99
#> 3 -1.98
#> 4 -1.97
#> 5 -1.96
#> 6 -1.95
#> 7 -1.94
#> 8 -1.93
#> 9 -1.92
#> 10 -1.91
# ... with 391 more rows
```

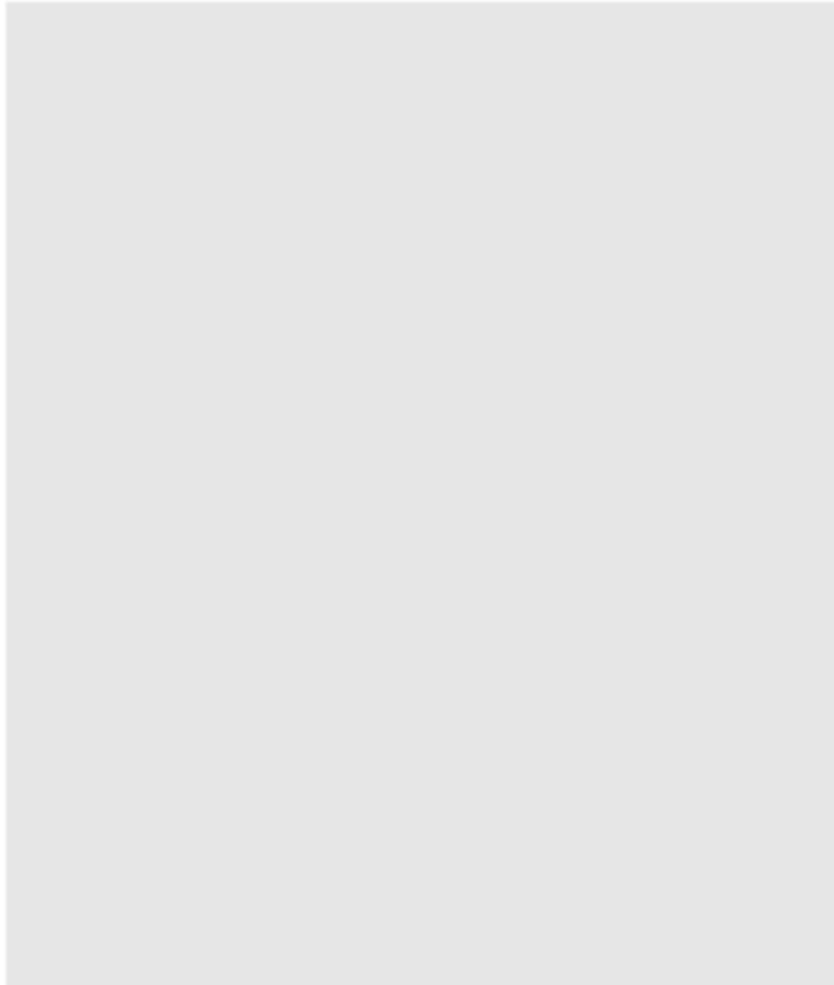
## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq)
```

```
# A tibble: 160,801 x 2  
      x     y  
  <dbl> <dbl>  
1    -2    -2  
2    -2   -1.99  
3    -2   -1.98  
4    -2   -1.97  
5    -2   -1.96  
6    -2   -1.95  
7    -2   -1.94  
8    -2   -1.93  
9    -2   -1.92  
10   -2   -1.91  
# ... with 160,791 more rows
```

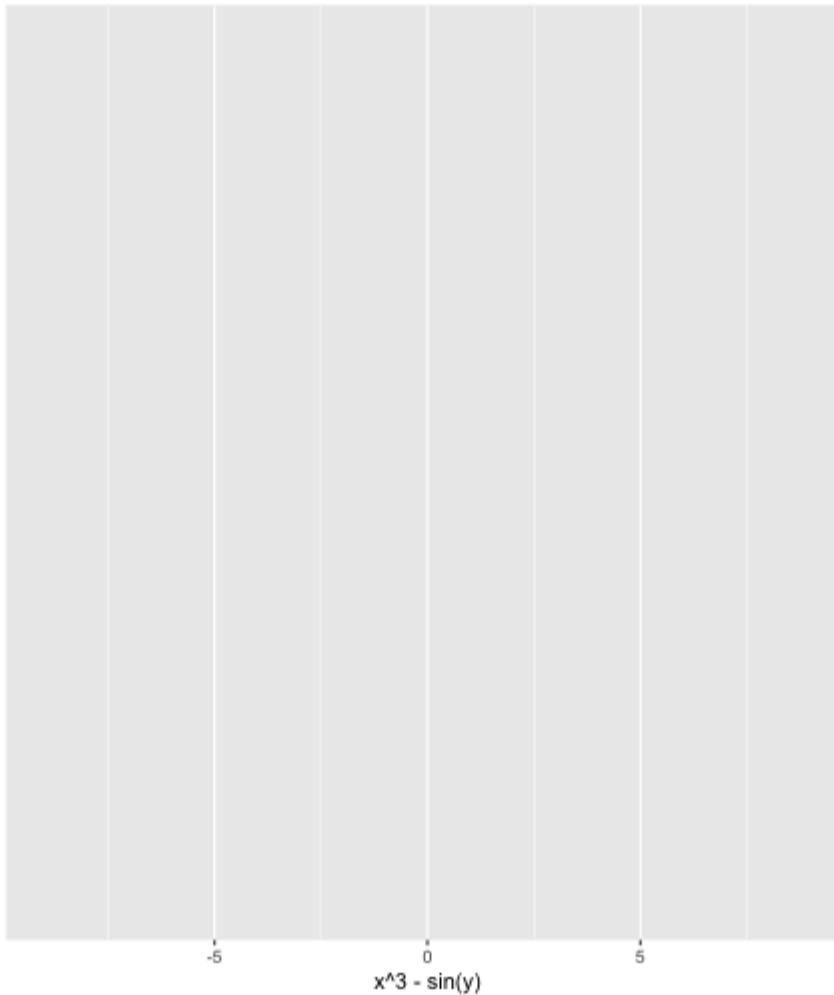
## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot()
```



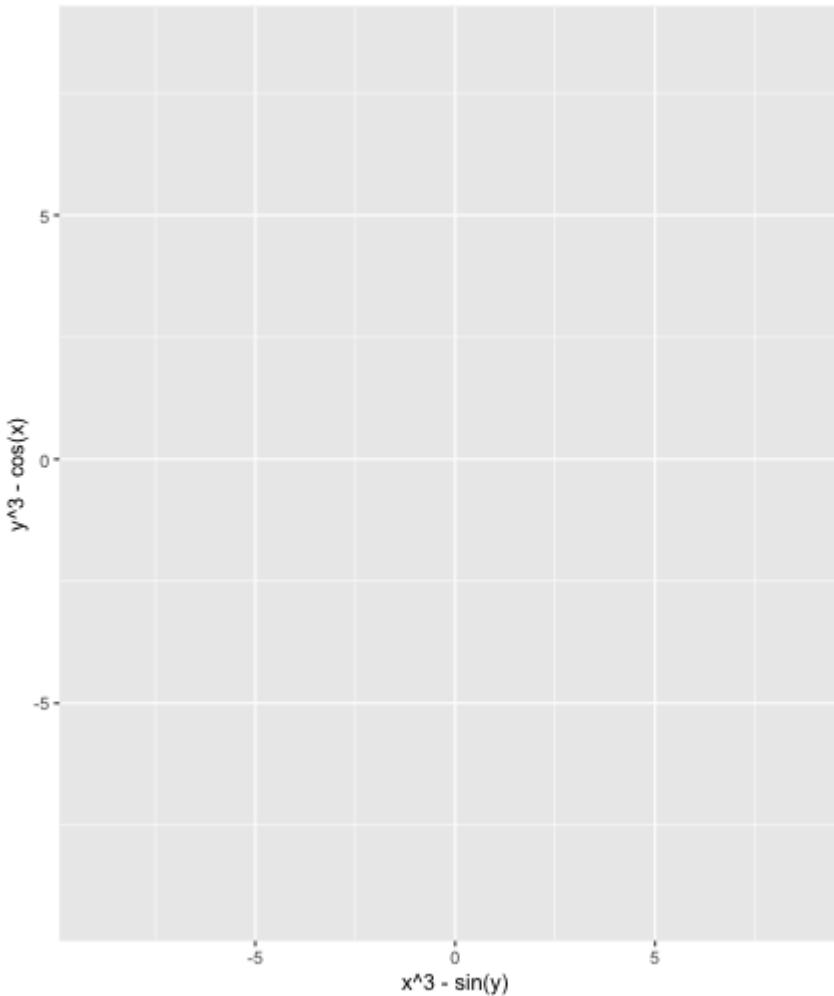
## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
    aes(x = x^3 - sin(y))
```



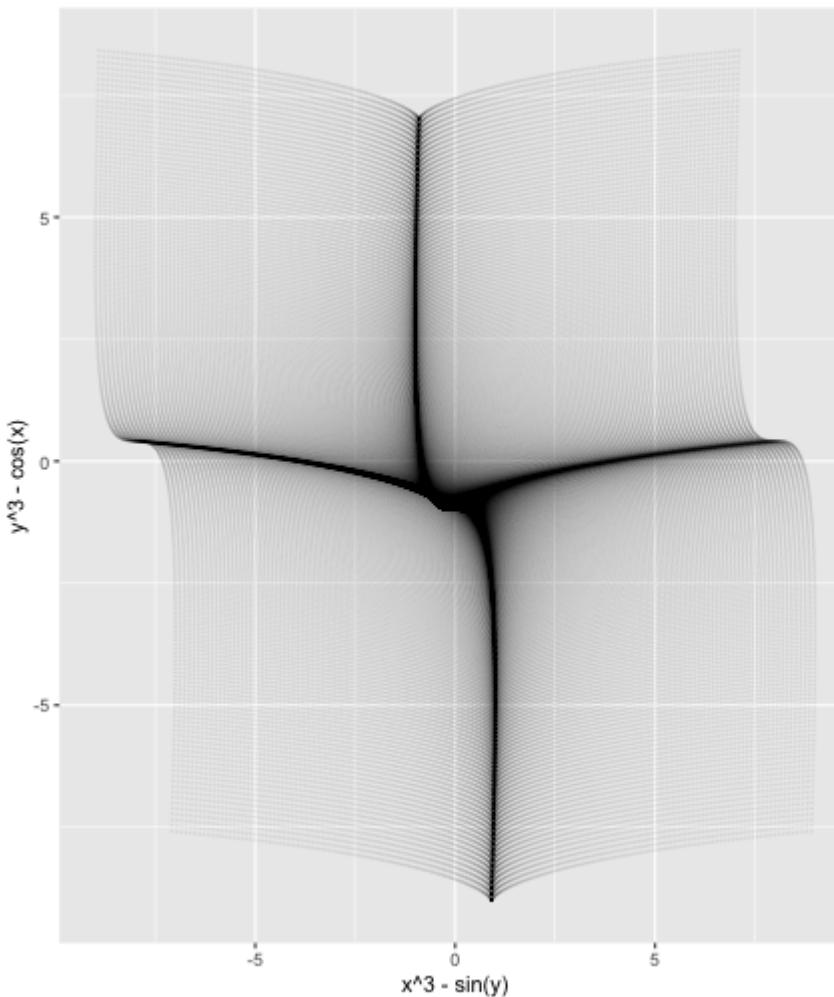
## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x^3 - sin(y)) +  
  aes(y = y^3 - cos(x))
```



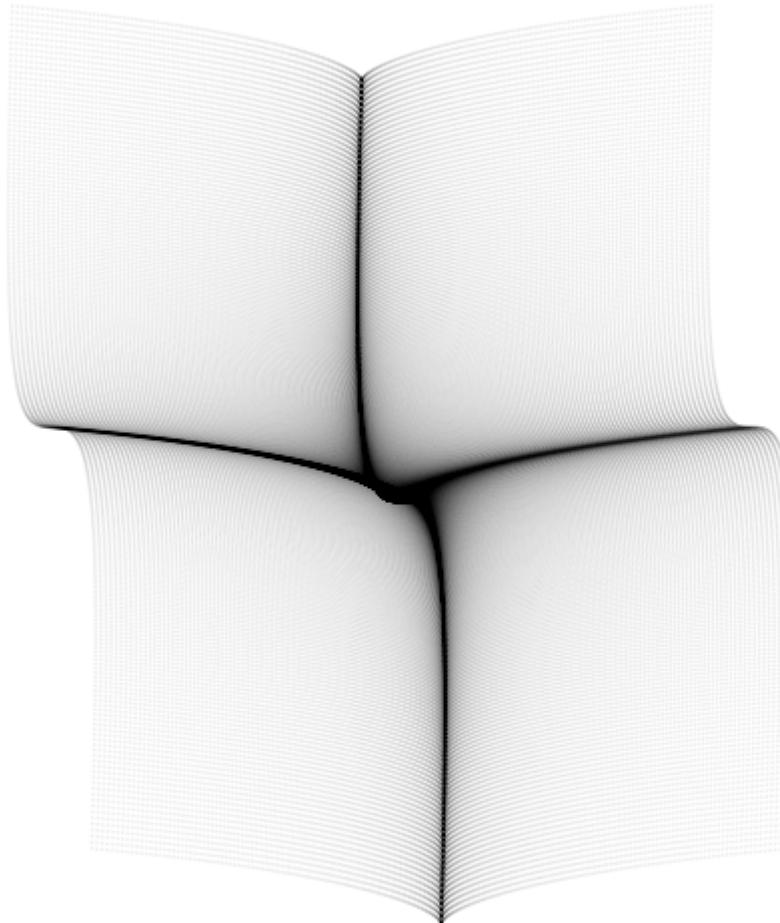
## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x^3 - sin(y)) +  
  aes(y = y^3 - cos(x)) +  
  geom_point(alpha = 0.05,  
             size = 0)
```



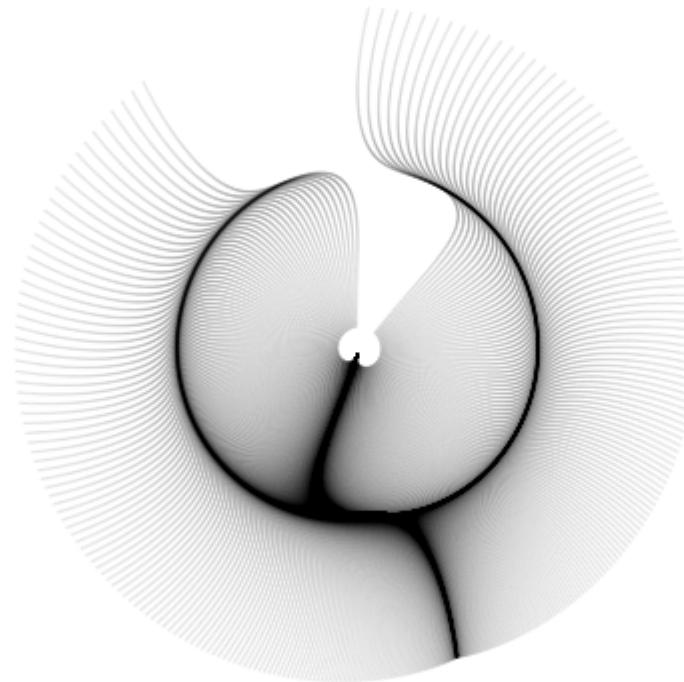
## Dandalion: One less deconstructed

```
seq(-2, 2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x^3 - sin(y)) +  
  aes(y = y^3 - cos(x)) +  
  geom_point(alpha = 0.05,  
             size = 0) +  
  theme_void()
```



## Dandalion: One less deconstructed

```
seq(-2,2, by = 0.01) ->  
  my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x^3 - sin(y)) +  
  aes(y = y^3 - cos(x)) +  
  geom_point(alpha = 0.05,  
             size = 0) +  
  theme_void() +  
  coord_polar()
```



## Dandalion: One less deconstructed

```
seq(-2,2, by = 0.01) ->  
my_seq  
  
tibble(x = my_seq) %>%  
  crossing(y = my_seq) %>%  
  ggplot() +  
  aes(x = x^3 - sin(y)) +  
  aes(y = y^3 - cos(x)) +  
  geom_point(alpha = 0.05,  
             size = 0) +  
  theme_void() +  
  coord_polar() +  
  labs(subtitle = "Dandelion")
```

Dandelion

