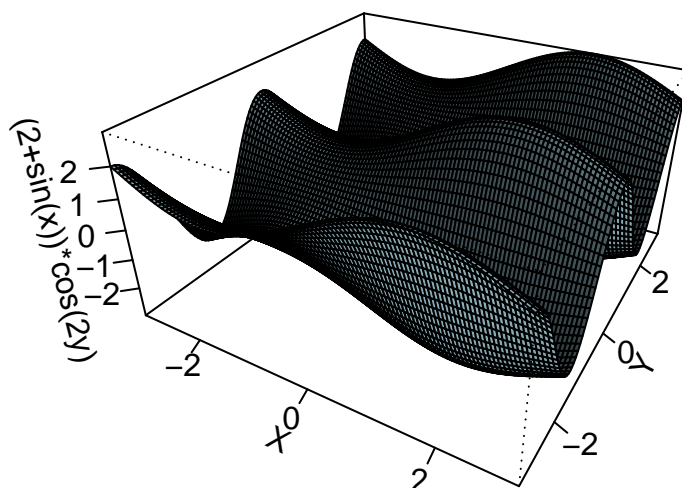# Assignment 3

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Question 1

Here are three different plots of the function $z = 2\cos(2y) + \cos(2y)\sin(x)$.
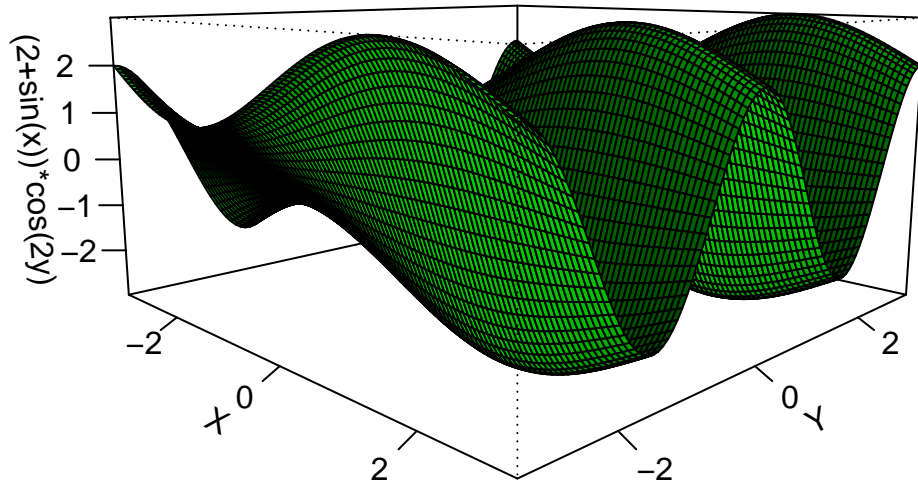
$\theta = 30, \phi = 30$

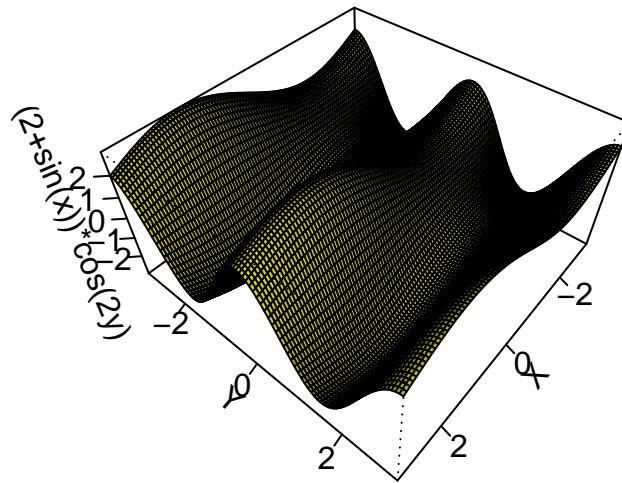**A surface plot of a 3D trig function**

A surface plot of a 3D trig function

A surface plot of a 3D trig function

Question 2

The function has been desgined and named question2. First, let us test the function on bad input. This input has NAs:

```
## Error in question2(c(1:100, NA, NA, 23)): Input contain NA
```

What about non-numeric input?

```
## Error in question2(c("A", "Z")): Input is not numeric
```

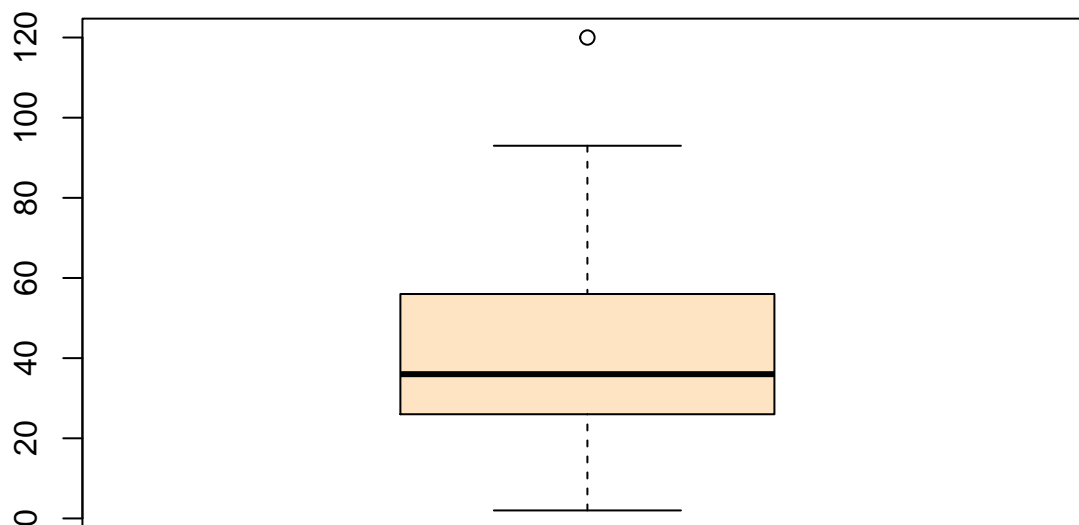Now, let us see its output when called on $n = seq(200; 5000; by = 600)$.

```
## $`Sum of minmums`
## [1] 3.26664e+11
##
## $`Sum of minmums`
## [1] Inf
```

Question 3

Let us test our function on the **cars** dataset.

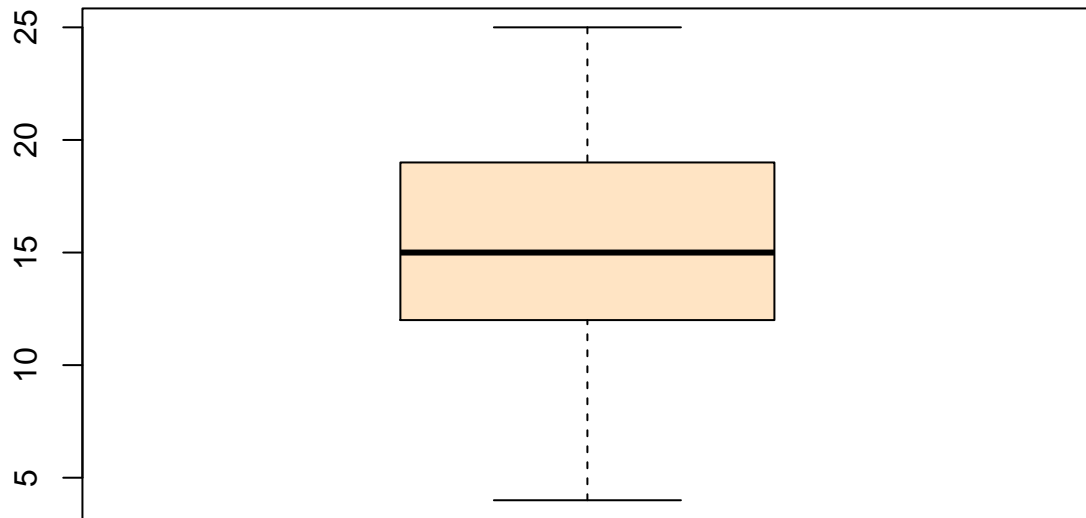First, we try out the function on the **dist** variable.

A boxplot of the input data

Input Data

```
## $IQR
## numeric(0)
##
## $`Left (Lower) Outliers`
## numeric(0)
##
## $`Right (Upper) Outliers`
## numeric(0)
```

Next, we try it on the **speed** variable.
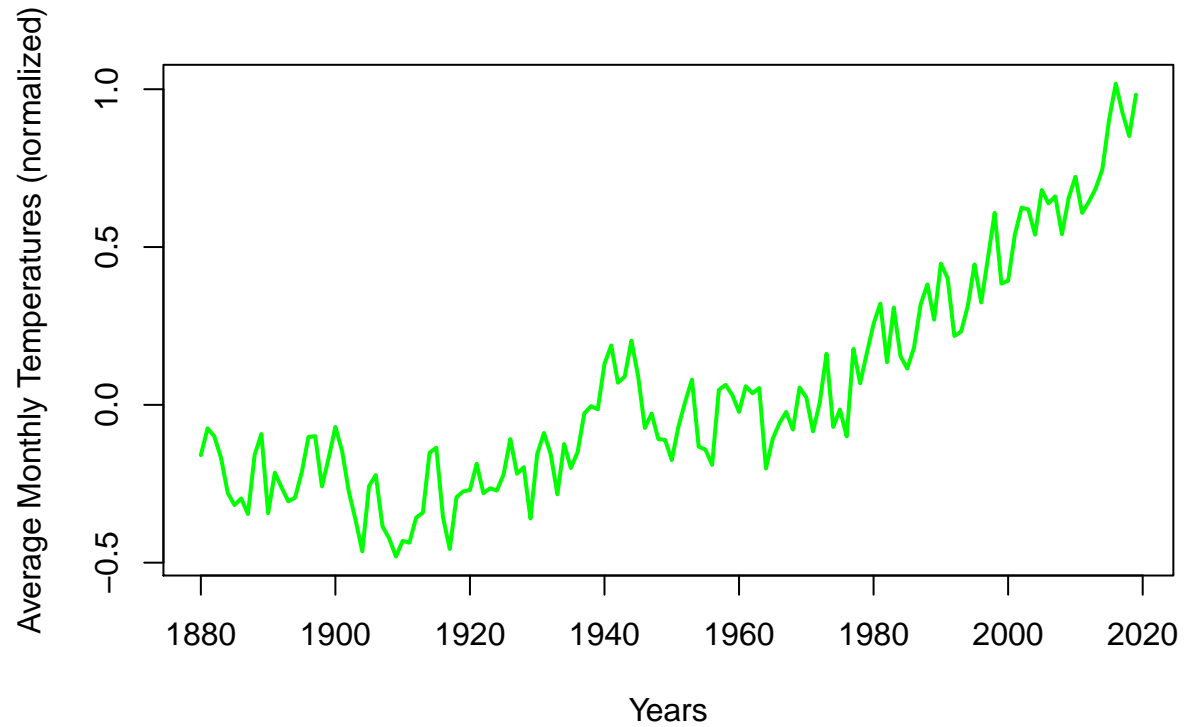
A boxplot of the input data

Input Data

```
## $IQR
## numeric(0)
##
## $`Left (Lower) Outliers`
## numeric(0)
##
## $`Right (Upper) Outliers`
## numeric(0)
```

Finally, we try it on bad input (i.e. NAs or non-numeric).

```
## Error in IQR.outliers(c("A", "Z")): Input is not numeric
```

```
## Error in IQR.outliers(c(2, NA)): Input contain NA
```
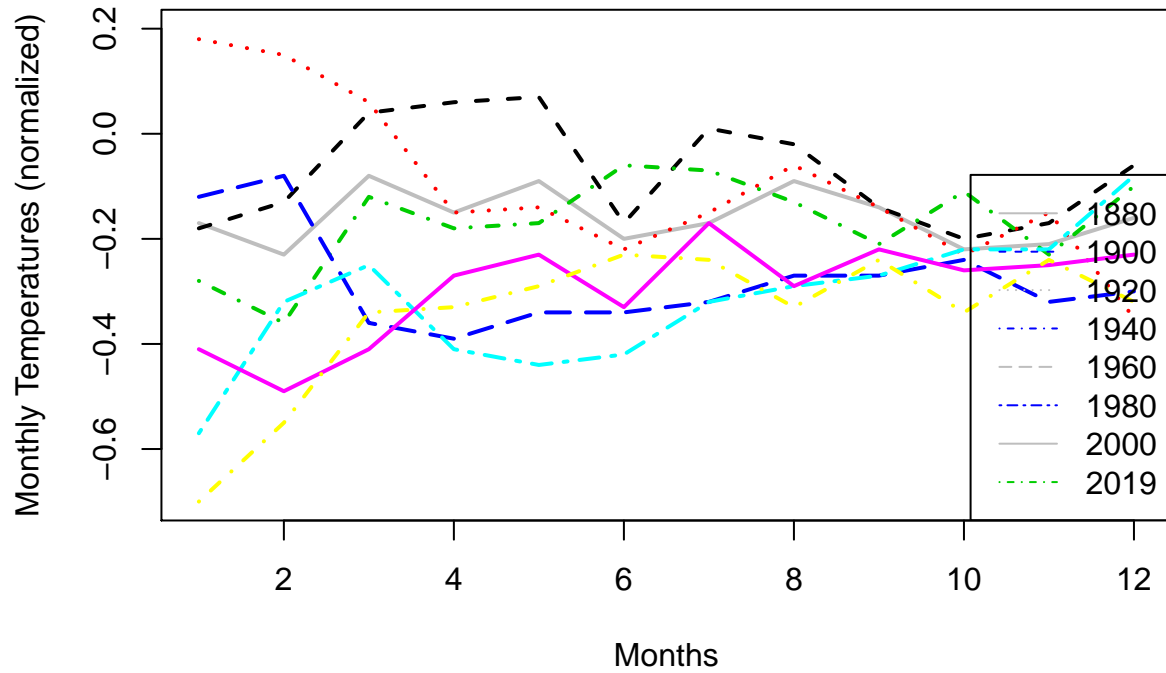
Question 4

Let us plot the monthly average temperatures from 1880 to 2019.

Note there is a clear trend here: The average temperature has been increasing since the 1900s.

Now, we look at the yearly temperature every two decades:

Temperatures over several decades

There is no discernable pattern when examining the temperatures month by month.

Question 5

Let us run the function on inputs **x=rnorm(20), y = -2**:

[1] -0.1104203

Now, let the inputs be **x=rnorm(20), y = median(x)**:

[1] -0.4378684

Finally, letting the inputs be **x=rnorm(20), y = 2**:

[1] 0.3920375