sense moderator r green.

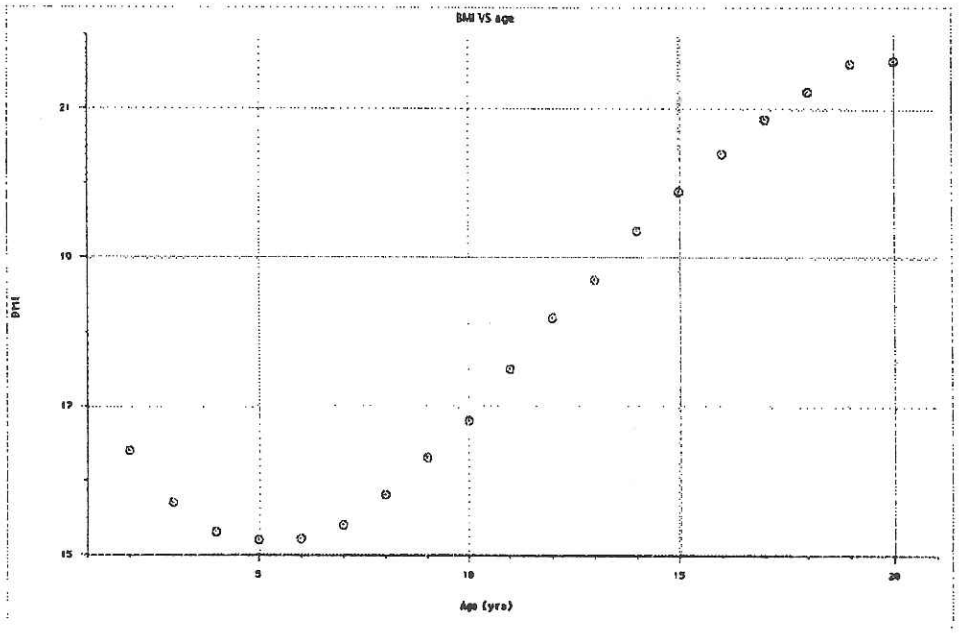
Introduction

In this portfolio, the main idea is to investigate around BMI (body mass index). BMI is a measure of body fat based on height and weight that applies to both adult men and women. (from yahoo.com) From the data given we can see that the median BMI varies along with age so in this portfolio I'm attempting to find the relationship between age and BMI so we can predict the further data the beyond the given data and compare with the actual data.

ok

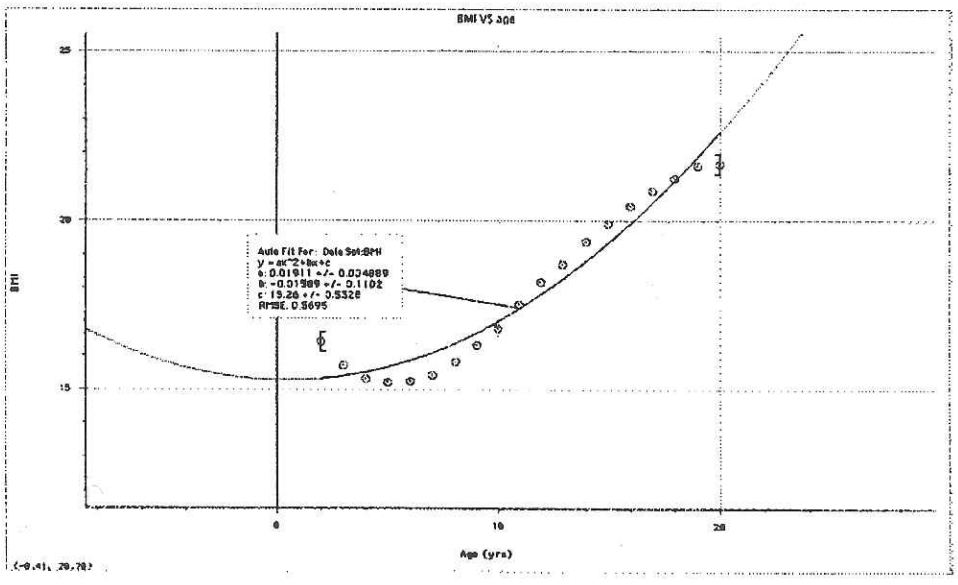
I have been given a set of data of the median BMI for females of different ages in the US in the year 2000. As we can see, the independent variable (thing you change) is the age and the dependent variable (thing you measure) is the BMI.

Age (yrs)	BMI
2	16.40
3	15.70
4	15.30
5	15.20
6	15.21
7	15.40
8	15.80
9	16.30
10	16.80
11	17.50
12	18.18
13	18.70
14	19.36
15	19.88
16	20.40
17	20.85
18	21.22
19	21.60
20	21.65



From the graph, we can see that the graph produce a very nice curve and it reminds me of the quadratic, cubic and sin graph because of the graph has 2 points of inflection (from the given data) and also it seems to form a pattern of sin graph (repeating unit of a wave-like shape). So my first attempt would be a cubic graph.

First attempt – quadratic

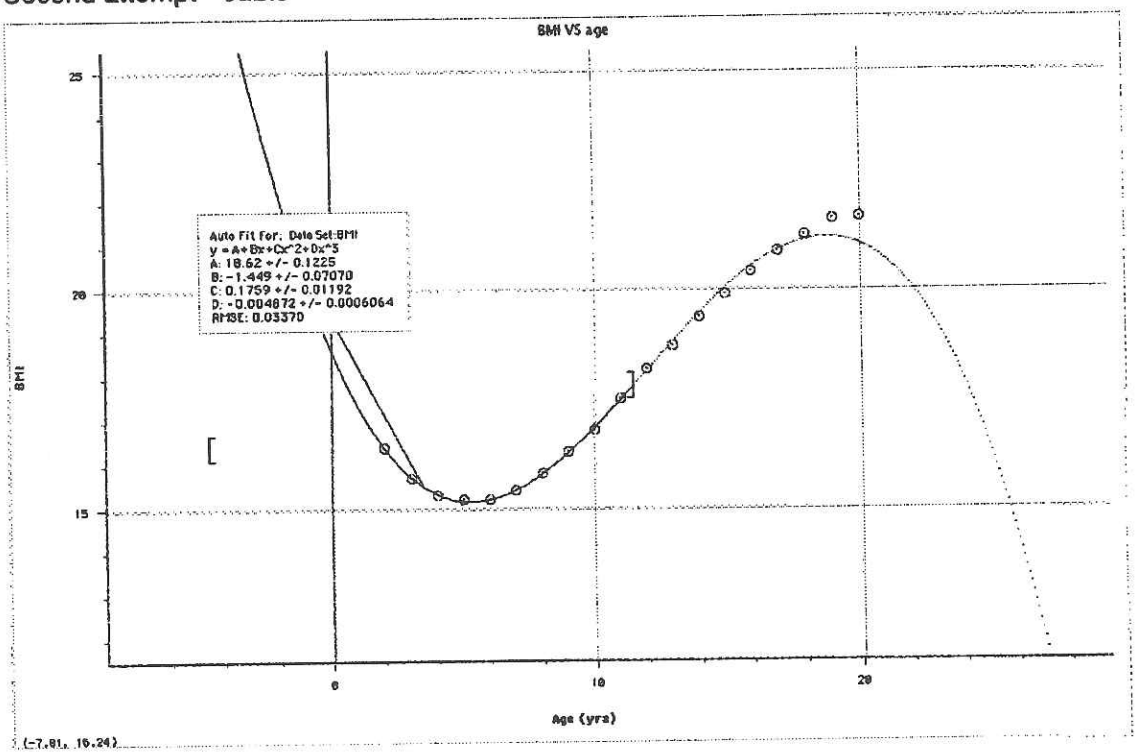


Equation from the graph:

$$y = 0.01911x^2 - 0.01589 + 15.26$$

We can see that the graph curve up at the end but then it would be truly impossible for the further BMI after age 20 would be increasing dramatically like this. Adult's weight don't increase with their age (at least no this much). So quadratic would not be the case for this one.

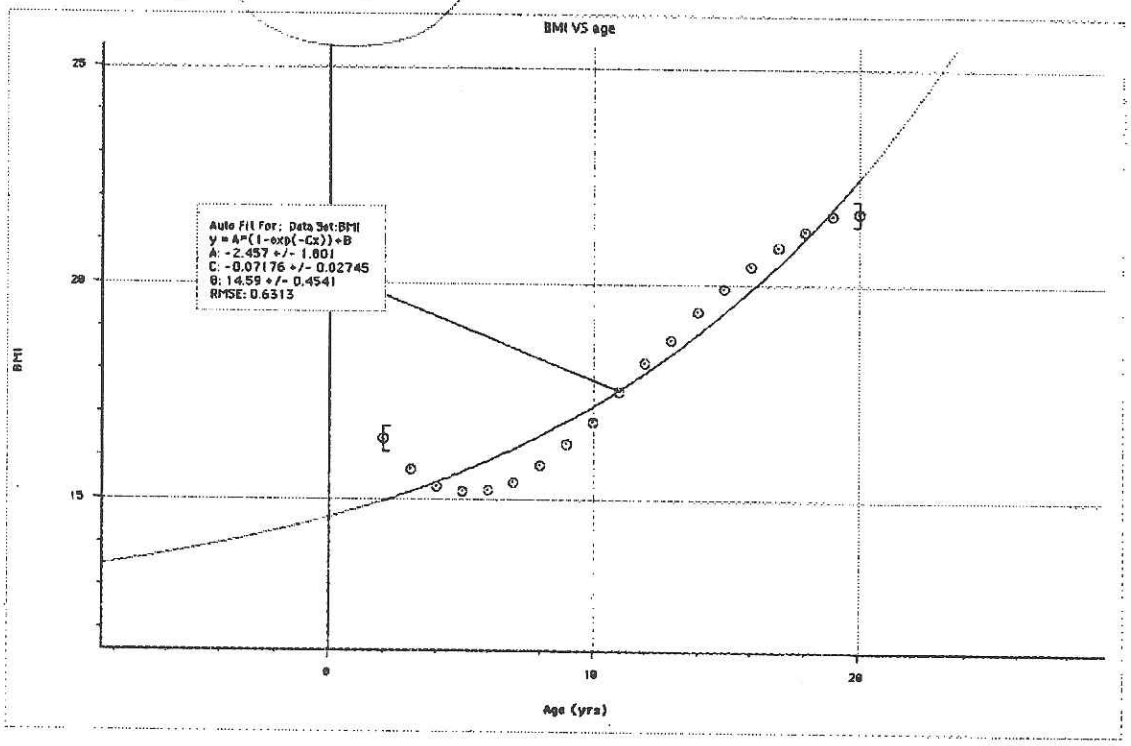
Second attempt - cubic



Equation of the model : $y = 18.2 - 1.4x + 0.18x^2 - 0.00408x^3$

The curve fits the graph very well but then if we think thoroughly the graph seems to be unrealistic because the line of best fit curves down at around the age 20 which doesn't make any sense because BMI is $\frac{mass}{height^2}$, so we know that adult's weight tend to increase over time but their height will not increase any more and might decrease again when they are really old (cause by osteoporosis). So, from this information we know that it would be impossible for the graph to curve down like this one above and it couldn't be a sin graph either because of the same reason as cubic graph.

Second attempt – inverse exponent

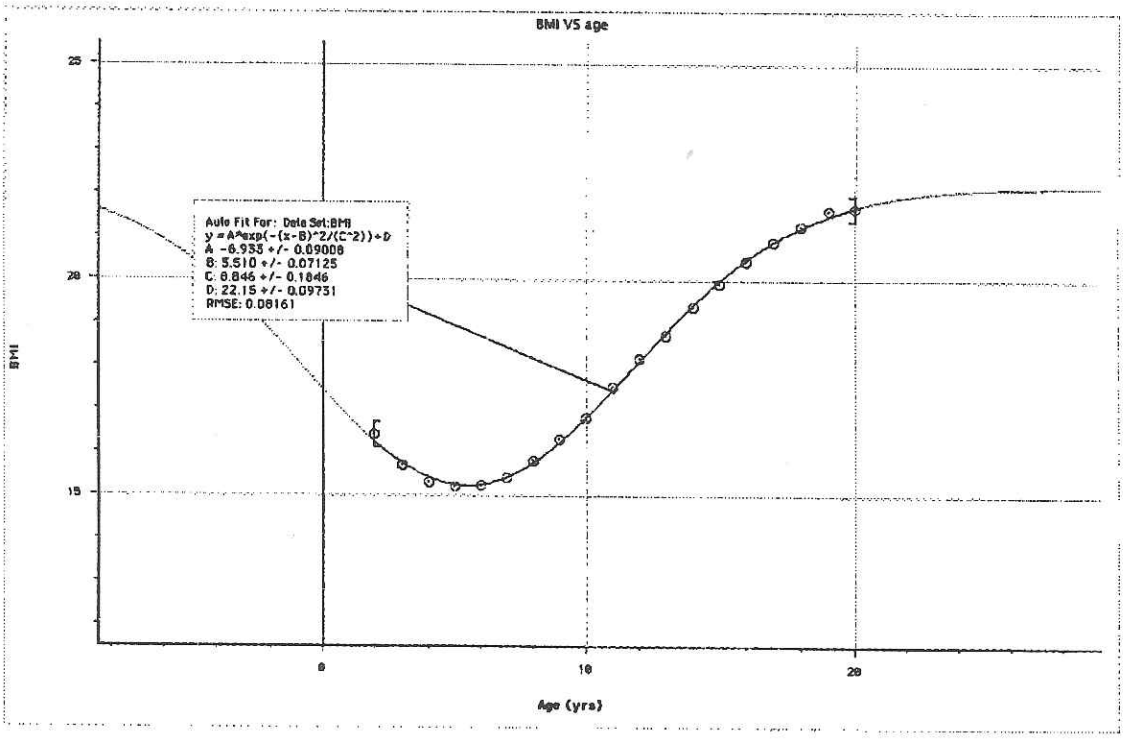


Equation from the graph:

$$y = -2.457*(1 - \exp(-0.072x)) + 14.59$$

As we can see the graph curve up but it doesn't seem to fit with the points. After observing it, I can see that the gradient is increasing (gradient at point 0-13 is less than 13-20) which doesn't make much sense because in reality children (age 0 -13) grow faster than adult so the gradient has to be more than adult.

Third attempt - Gaussian function



Equation from the graph:

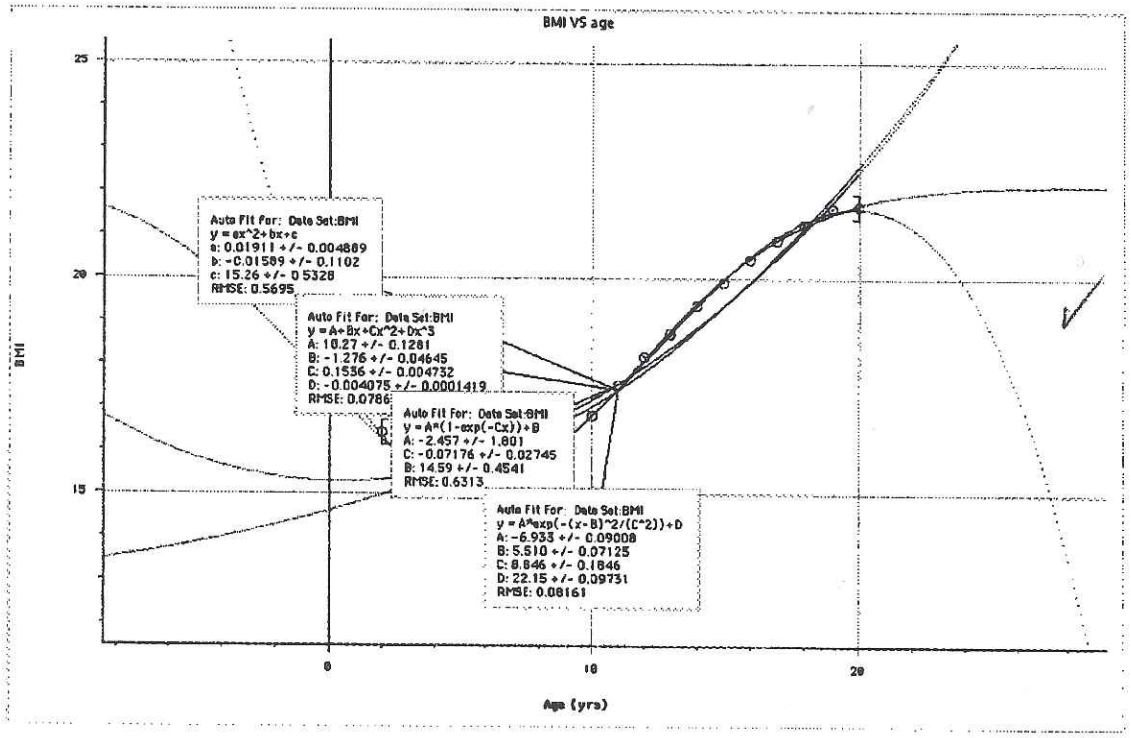
$$y = -6.9e^{\frac{(x-5.510)^2}{-0.3446}} + 22.15$$

This Graph seems to make sense because we don't tend to grow that much and the weight seem to be more stable compare to when they were a child and it also fit the curve perfectly. In this graph it has higher RMSE value (0.08161) compare to other graph

Good point

All tested model

Good visual comparison.



In comparison, we can see that every curve except gaussian model produce a strange dramatical increase or decrease at the age 20. This would be impossible to get the this from the above reasons I have mentioned. Only gaussian would be possible although it seem to be strange to because people's weight don't stay the same throughout their life.

Test the model- age 30

I think that the most reasonable fit would be the gaussian so it's time to estimate the BMI for woman in US at age 30.

Using Gaussian model

$$BMI = -6.933e^{\frac{-(x-5.510)^2}{2(-8.846)^2}} + 22.15\ kgm^{-2}$$

$$BMI = -6.933e^{\frac{-(30-5.510)^2}{2(-8.846)^2}} + 22.15 \approx 22.15 kgm^{-2}$$

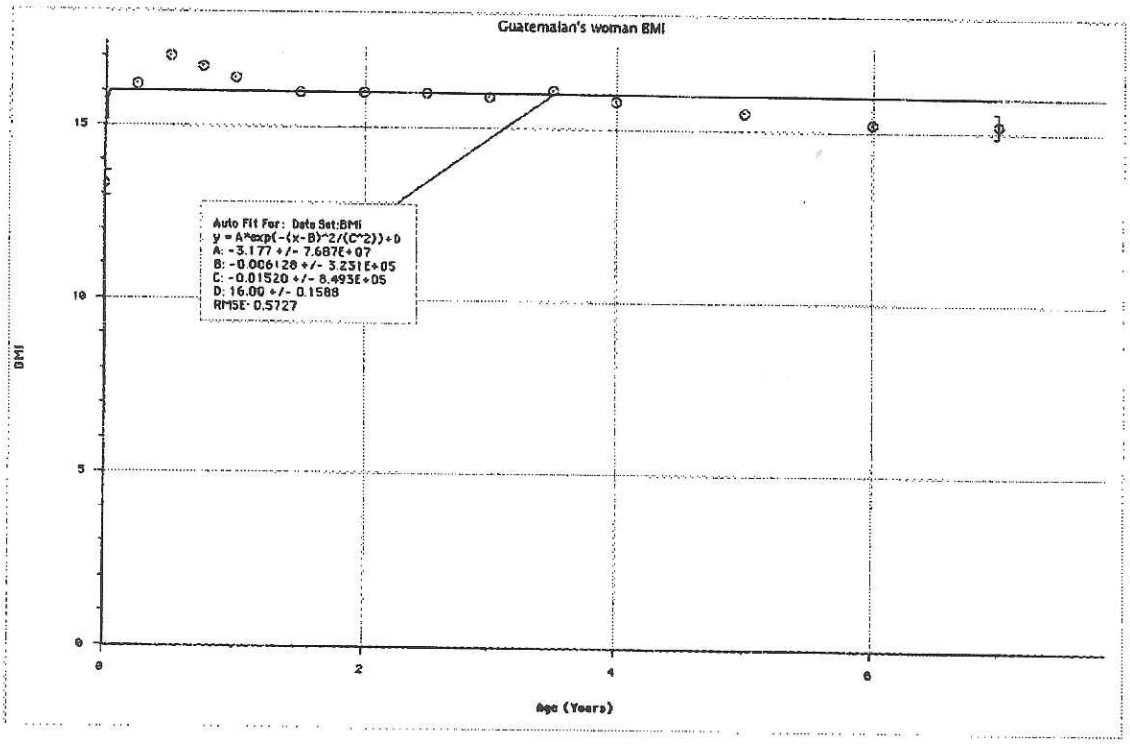
for what age?

Note the real BMI is 22.22 so it pretty accurate and really reasonable.

(99.7% accurate) (calculate using GDC)

BMI from other country – Guatemalan

Age	BMI (median)
0	13.3
0.25	16.2
0.5	17.0
0.75	16.7
1.0	16.4
1.5	16.0
2.0	16.0
2.5	16.0
3.0	15.9
3.5	16.1
4.0	15.8
5.0	15.5
6.0	15.2
7.0	15.2
11.0-11.9	16.5
12.0-12.9	17.2
13.0-13.9	18.8
14.0-14.9	19.3
15.0-15.9	20.2
16.0-16.9	21.6
17.0-17.9	21.8
18.0-24.9	21.8



From the graph we can see that the graph produce a straight line which doesn't seem to fit it that well. The BMI of a person doesn't stay stably throughout their life so this fit would be impossible.

X.

?

You need to compare two sets & discuss limitations and modifications.

The work is not complete

My grades :

A - 1
B - 1
C - (2) - no constraints? even though gets model
D - (1) (2)
E - 2
F - 0 (1)

9

& Mood

A - 1
B - 2
C - 2 (no analytical model)
D - 3
E - 2
F - 1

11