IM2 Problem Set 4.5 - Data, Scatter Plots and Functions - WRITING ASSIGNMENT

TASK 1

The table lists the world records for the 100 m men's sprint from 1983 to 2009.

Athlete	Nationality	Year	Time (s)
1. Willie Williams	USA	1956	10,1
2. Armin Hary	West Germany	1960	10,0
3. Jim Hines	USA	1968	9,95
4. Calvin Smith	USA	1983	9,93
5. Carl Lewis	USA	1988	9,92
6. Leroy Burrell	USA	1991	9,90
7. Carl Lewis	USA	1991	9,86
8. Leroy Burrell	USA	1994	9,85
9. Donovan Bailey	Canada	1996	9,84
10. Maurice Greene	USA	1999	9,79
11. Tim Montgomery	USA	2002	9,78
12. Asafa Powell	Jamaica	2005	9,77
13. Asafa Powell	Jamaica	2007	9,74
14. Usain Bolt	Jamaica	2008	9,72
15. Usain Bolt	Jamaica	2008	9,69
16. Usain Bolt	Jamaica	2009	9,58

(Source: http://www.rss.org.uk/uploadedfiles/documentlibrary/803.pdf)

1. Use the data to draw a scatter plot on DESMOS or your TI-84

2. Describe the correlation between the two variables in words. Is there a direct cause and effect relationship between the variables or is it possible that the relationship between the two variables may be a coincidence?

3. Use DESMOS or your calculator to draw and determine the linear regression function ($y = mx + b$) that best models the data.

4. Use the linear regression function to complete the following table:

Year	1960	1968	1988	1999	2005	2008
Time *(s)*						

5. Use DESMOS or your calculator to determine the quadratic regression function ($y = a(x - h)^2 + k$) that best models the data.

6. Use the equation of the quadratic regression function to complete the following table:

Year	1960	1968	1988	1999	2005	2008
Time *(s)*						

7. Use DESMOS or your calculator to determine the exponential regression function ($y = ab^x$ - or "clever variations") that best models the data.

8. Use the equation of the exponential regression function to complete the following table:

Year	1960	1968	1988	1999	2005	2008
Time *(s)*						

9. Complete the following table by filling in the sets of values that you have calculated on it.

Year	**Actual time (s)**	**Value of linear regression function *(s)***	**Value of quadratic regression function *(s)***	**Value of exponential regression function *(s)***
1960	10,0			
1968	9,95			
1988	9,92			
1999	9,79			
2005	9,77			
2008	9,69			

10. What would you predict the world record time in 2020 should be? Explain/show your reasoning.
11. How confident are you about your prediction for the 2020 world record time? Explain your reasoning.
12. Which regression function suits the context best? Give reasons for your answer.

TASK 2

Felix Baumgartner of Austria holds the record for high altitude skydiving. In October 2012 he skydived an estimated 39 km. His highest speed reached before the air resistance started slowing him down, was 1342 km/h or 373 m/s which is faster than the speed of sound.
(https://www.theguardian.com/media/2012/oct/15/felix-baumgartner-skydive-youtube)

The following table gives the speed, v in m/s, at which a skydiver is moving after having travelled a through a distance, s in m, from a helium balloon which was at a great height when the skydiver jumped.

Distance s (m)	130	530	1 050	1 540	2 710	3 750
Speed v (m/s)	52	103	145	175	233	274

1. Draw a scatter plot of the data on DESMOS or your calculator.

2. Use DESMOS or your calculator to fit the following regression functions to the data:
   a. Linear b. Exponential

3. Use the two models and the calculator to determine the speed of the skydiver after falling through a distance of
   a. 1,000 m b. 2,700 m c. 3,700 m

4. Which of the two models fits the data better? Give reasons for your choice.