**Foundations of Mathematics 12**

**Assignment 2: Scatterplots & Regression of Polynomials** (35 PTS TOTAL)

1. The winning times for the women’s 100 m freestyle swim in the Summer Olympics for most years from 1984 to 2016, Table 1. Penny Olesiak of Canada won this race at the Olympics in 2016. (total of 12 pts)

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| **Table 1:** Winning times for the women’s 100 m freestyle swim in the Olympics  |
| **Year** | **Winning Time (s)** |
| 1984 | 55.92 |
| 1988 | 54.93 |
| 1992 | 54.64 |
| 2000 | 53.83 |
| 2004 | 53.84 |
| 2008 | 53.12 |
| 2016 | 52.70 |

1. Identify x (independent) and y (dependent) variables. (2 pts)
2. Use linear regression to determine the equation for the **line** of best fit for the data. (1 pt)
3. Briefly describe the data trend (including end behaviour, number of intercepts and turning points, domain and range). (3 pts)
4. Use the linear regression to determine the possible winning time for the event in 1996. (4 pts)

Is this an example of interpolating or extrapolating?

The actual winning time was 54.50 seconds. Why is this value different the value you found?

1. The 2020 Summer Olympics are to be held in Tokyo, Japan. Predict the winning time for the women’s 100 m freestyle swim at these games. (2 pts)
2. A biochemist is studying the growth of bacteria. She collects data, Table 2. (total of 10 pts)

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| **Table 2:** Growth of bacteria mass (g) in test tube over time (days) |
| **Day** | **Mass (g)** |
| 1 | 3.2 |
| 2 | 4.6 |
| 3 | 5.4 |
| 4 | 4.2 |
| 5 | 5.5 |
| 6 | 7.1 |
| 7 | 8.0 |
| 8 | 9.2 |

1. Identify x and y variables. (2 pts)
2. Use **cubic regression** to determine the equation of the **curve of best fit** for the data. (2 pts)
3. Briefly describe the data trend (including end behaviour, number of intercepts and turning points, domain and range). (3 pts)
4. Estimate the mass of bacteria on Day 11. Did you interpolate or extrapolate? (3 pts)
5. Ms. Wilson likes to solve jigsaw puzzles on the Internet. She recorded the times she took to solve puzzles with different numbers of pieces. (total of 12 pts)

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| **Table 3:** The time Ms. Wilson takes to solve puzzles and the number of pieces in the puzzle. |
| **Number of pieces in puzzle** | **Time to solve (s)** |
| 0 | 0 |
| 12 | 53 |
| 20 | 100 |
| 54 | 442 |
| 72 | 817 |
| 120 | 2293 |

1. Identify x and y variables. (2 pts)
2. The **quadratic regression** function that models the data is: (2 pts)
3. Briefly describe the data trend (including end behaviour, number of intercepts and turning points, domain and range). (3 pts)
4. How long would it take Bob to solve a puzzle with 100 pieces, to the nearest second? Did you extrapolate or interpolate to determine your answer? (3 pts)
5. How many pieces would be in a puzzle that takes 5000 seconds to solve? (2 pts)
6. Darcy is planning to build a stable for 15 horses. He has found that other reputable stables in the neighbourhood have the following areas, Table 4. (total of 6 pts)

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| **Table 4:** Area of stable and number of horses in Darcy’s neighbourhood. |
| **Number of Horses** | **Area (ft2)** |
| 3 | 480 |
| 5 | 750 |
| 6 | 930 |
| 11 | 1881 |
| 14 | 2600 |
| 21 | 3024 |

Darcy has decided his stable will have a comparable area.

* Use a regression to determine how many square feet the stable should have. Briefly explain the type of regression you choose and why! (Hint: What were the trends in the data that helped you decide?)
* Provided a recommended area for Darcy so he can design his stable appropriately.
* **\*\*\*Please include the variables of x and y that you selected\*\***