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| Test 2Dusty Wilson Math 111No work = no creditNo Symbolic Calculators | **Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*Madam, I have come from a country where people are hanged if they talk.* Leonard Euler (1707 - 1783) Swiss mathematician |

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| Warm-ups (1 pt each): | =\_\_\_\_\_ | =\_\_\_\_\_ | =\_\_\_\_\_ |

(1 pt) In the quote above, Leonard Euler excuses his taciturnity in conversation to the Queen Mother of Prussia following his return from Russia. Based upon the quote above, was free speech encouraged in 18th century Russia? Answer using complete English sentences.

(4 pts) Find the exact solution to: 

 (8 pts) Algebraically find the vertex and *x* and *y* intercepts of. Show your work.

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| vertex |  | *x* intercept(s) |  | *y* intercept(s) |

 (2 pts) Consider the data and model shown in the given picture. The model is . What is the residual when ? Hint: Is the residual positive or negative?

Note: the given data point is (8,44)



(4 pts) The table gives the average gas price ($/gal) in Seattle where x is given in months since January 2014 (January 2014 is  ) . Data is taken from a chart on gasbuddy.com

1. Find a quadratic model  for the data where x is given in months since January 2014. Give your answer to three decimal places.

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| **Month** | **Gas Price** |
| 1 | $3.34 |
| 3 | $3.74 |
| 5 | $3.97 |
| 7 | $3.96 |
| 9 | $3.71 |
| 11 | $3.10 |
| 13 | $2.30 |

1. Find and interpret 

(4 pts) Solve  using any algebraic method. Give the exact answer(s).

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| (6 pts) Consider 1. Evaluate
2. Carefully sketch a graph of
3. What is the domain of *g*?
4. What is the range of *g*?
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(2 pts) Suppose you want to model the total cost of renting a new 2 bedroom apartment.

* There is a non-refundable $500 deposit.
* Then you sign a six month lease to pay $1000 per month in rent.
* After six months, your rent goes up to $1050/mo.

Set up a piecewise defined function to model the total cost of the apartment where *x* is given in months since you moved in.

 (8 pts) Suppose a company has fixed costs of $300 and variable costs of  dollars per unit, where *x* is the total number of units produced. Suppose further that the selling price of its product is  dollars per unit.

1. Formulate the functions for total cost, revenue, and profit.

1. Algebraically find and interpret the break even points.

1. Algebraically find and interpret the vertex of the profit function.
2. Find and interpret the selling **price** for the item when profit is maximized.