**MATH133 UNIT 2: Quadratic Equations**

**Individual Project Assignment: Version 2A**

**Name (Required): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Show all of your work details for these calculations. Please review [this Web site](http://www.purplemath.com/modules/mathtext.htm) to see how to type mathematics using the keyboard symbols. Handwritten scanned work is not acceptable for AIU Online.

**Problem 1: Modeling Profit for a Business**

**IMPORTANT: See Question 3 below. This is mandatory.**

Remember that the standard form for the quadratic function equation is *y* = *f* (*x*) = *ax2* + *bx* + *c* and the vertex form is *y* = *f* (*x*) = *a*(*x* – *h*)*2* + *k*, where (*h*, *k*) are the coordinates of the vertex of this quadratic function’s graph.

You will use *P*(*x*) = -0.2*x2* + *bx* – *c* where (-0.2*x2* + *bx*) represents the business’s variable profit and *c* is the business’s fixed costs.

So, *P*(*x*) is the store’s total annual profit (in $1,000) based on the number of items sold, *x*.

1. (List your chosen value for between 100 and 200.)

1. (List what the fixed costs might represent for your fictitious business, and be creative; also list your chosen value for c from the table below).

|  |  |
| --- | --- |
| If your last name begins with the letter | Choose a fixed cost between |
| A–E | $5,000–$5,700 |
| F–I | $5,800–$6,400 |
| J–L | $6,500–$7,100 |
| M–O | $7,200–$7,800 |
| P–R | $7,800–$8,500 |
| S–T | $8,600–$9,200 |
| U–Z | $9,300–$10,000 |

1. **Important: By Wednesday night at midnight, submit a Word document with only your name and your chosen values for *b* and *c* above in Parts 1 and 2. Submit this in the Unit 2 IP submissions area. This submitted Word document will be used to determine the Last Day of Attendance for government reporting purposes.**
2. (State that quadratic profit model function’s equation by replacing and with your chosen values.)

*P*(*x*) = -0.2*x2* + *180x* – 6500

1. (Choose five values of (number of items sold) between 500 and 1000. Insert those -values in the table.)



|  |  |
| --- | --- |
|  |  |
| 510 |  |
| 603 |  |
| 880 |  |
| 723 |  |
| 561 |  |

1. Plug these five values into your model for and evaluate the annual business profit given those sales volumes. (**Be sure to show all your work for these calculations**; complete the table below.)



|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
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|  |  |

1. Use the five ordered pairs of numbers from 5 and 6, and Excel or another graphing utility, to graph your quadratic profit model and insert the graph into your Word answer document. The graph of a quadratic function is called a*parabola*. (**Insert graph below**.)
2. (Show work details or explain how you found the vertex. Write the vertex in ordered-pair form: .)

1. (Write the explanation and the equation of the line of symmetry.)
2. (Write your quadratic profit function in vertex form, where is the vertex of this quadratic function’s graph. Show the details of how you found this equation.)

1. (State the maximum profit (if any), and show how you determined how many items must be sold to give the maximum profit.)
2. (State how knowing the number of items sold that produces the maximum profit help you to run business more effectively.)
3. (Give an analysis of the results of these profit calculations, and give some specific examples of how these calculations could influence your business decisions.)
4. (State which intelli**path** Learning Nodes seemed to be most helpful in completing this assignment.)

**Problem 2: Fencing a Backyard**

Suppose that you need to fence a rectangular play area in your backyard for your child or pet. Further, suppose that you know the length must be 8 feet longer than the width. The back of your house will serve as one side of the fenced area. **Note:** The perimeter (distance around) of a general rectangle is *P* = 2*L* + 2*W*, and its area is *A* = *L* x *W*. In this situation, *P* = *L* + 2*W*.

House

*L* feet

*W* = *L* – 8 feet

1. (Write the value of area chosen.)

|  |  |
| --- | --- |
| If your last name begins with the letter | Choose an area that must be fenced in this range (in square feet) |
| A–E | 3,000–3,999 |
| F–I | 4,000–4,999 |
| J–L | 5,000–5,999 |
| M–O | 6,000–6,999 |
| P–R | 7,000–7,999 |
| S–T | 8,000–8,999 |
| U–Z | 9,000–9,999 |

1. (Write the equation of the perimeter in terms of the length, *L*, only.)

Let x= width

x+8= length

P= 2L+2W

 (x+8)^2+x^2=P

1. (Write the area equation in terms of the length, *L*, only.)

 x+8\*x=area

1. (What can you observe about the characteristics of that quadratic area function? Will this quadratic function’s graph cross the horizontal axis? How do you know?)
2. (Show all your work for finding both the length and the width of this rectangular fenced area.)

**x(x+8)=5000
x^2+8x=5000
x^2+8x-5000=0**

**a=1 b=8 c=-5000**

**x** ≈66.82

x+8=74.82

1. (Show all your work for calculating the cost of the fence.)
2. (Show all your work for calculating the cost per square foot of the fenced area.)
3. (What observations and conclusions can you make about the results of them?)
4. (List the intelli**path** Learning Nodes that were helpful with this assignment,)

**Reference**

*Formatting math as text*. (n.d.). Retrieved from the Purple Math Web site: http://www.purplemath.com/modules/mathtext.htm