**MATH133 – Unit 2 Individual Project**

**NAME (Required): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Please show all work details with answers, insert the graph, and provide answers to all of the critical thinking questions on this document.**

Suppose you have a startup company that develops and sells a gaming app for smartphones. You get to know the financial performance of this by understanding your cost, revenue and profit.

The monthly **cost function** (in US dollars) of developing your app is$ C\left(x\right)=2x+b$, where $C\left(x\right)$ is the cost and$ x$ is the number of app downloads. The $2 in the equation is called the variable cost per gaming app download and ***b*** is called the fixed cost.

The monthly **revenue function** (in US dollars), based on previous monthly sales, is modeled by the function, $R\left(x\right)=-0.6x^{2}+362x$**,** $0\leq x\leq 300.$

The monthly **profit function** (in US dollars), $P\left(x\right),$ is derived by subtracting the cost from the revenue, i.e. $P\left(x\right)=R\left(x\right)-C\left(x\right)$**.**

**For each question, be sure to show all your work details for full credit.** **When applicable, round all value answers to the nearest cent.**

|  |  |
| --- | --- |
| **First letter of your last name** | **Possible values for *b*** |
| A-F | $1,000 - $1,500 |
| G-L | $1,501 - $2,000 |
| M-R | $2,001 - $2,500 |
| S-Z | $2,501 - $3,000 |

1. Based on the first letter of your **LAST** name, choose a value for your fixed cost, ***b***. Use your chosen value of $b$ to write your cost function, $C(x)$. Then use $P\left(x\right)=R\left(x\right)-C\left(x\right),$to write your simplified profit function? (Show your work details.)
2. Using the vertex formula (-b/2a), at how many downloads would your company achieve a maximum profit? How much is this maximum profit? (Show your work details)
3. How many downloads would give you a profit of $20,000 the next month? (Show your work details. Hint: Let the profit function be equal to $20,000 and solve for ***x*** using the quadratic formula. Since the domain of the Profit function is [0,300], be sure your value of $x$ is between 0 and 300.)
4. Complete the table below by calculating the profit for each number of downloads. (**Show your work details for** $x=50$ **and** $x=200$**, ONLY.**)

|  |  |
| --- | --- |
| ***x,*** number of downloads | ***P(x)***, profit in US dollars |
| 0 |  |
| 50 |  |
| 100 |  |
| 200 |  |
| 300 |  |

1. Using the table from part 4, generate a graph of your profit function using Excel or another graphing utility. (There are free downloadable programs like [Graph 4.4.2](http://www.padowan.dk) or Microsoft’s [Mathematics 4.0](https://www.microsoft.com/en-us/default.aspx); or online utilities like [this](http://www.desmos.com) [site](https://www.desmos.com/) ; and there are many others.) Insert the graph into the supplied Student Answer Form. **Be sure to label and number the axes appropriately so that the graph matches the chosen and calculated values from above. Your graph will be only a part of a parabola since the domain of this quadratic function is [0, 300].**
2. Do you think developing a mathematical model of a profit function such as the one in this assignment can help a company to understand its start-up dynamics? Explain the reasoning that led to your conclusion.

**References**

*Desmos*. (n.d.). Retrieved from <https://www.desmos.com/>

*Graph 4.4.2*. (n.d.). Retrieved from the Graph Web site: <http://www.padowan.dk/>

*Mathematics 4.0*. (n.d.). Retrieved from the Microsoft Web site: <https://www.microsoft.com/en-us/default.aspx>