30/05/20

**THM 121 Business Mathematics**

**Final Exam**

**Note to the students**:

* Calculations to reach your answers shall be thoroughly shown. Otherwise, questions will NOT be graded.
* You can use a calculator throughout the exam.
1. Consider the following equation of a line: 5y – 3χ = 4
2. Find the **slope** and the **intercepts** of the line. (**3** Points)
3. Sketch the **graph** of the line. (**2** Points)
4. A car rental agency charges **$ 40** per day plus **65** cents per kilometer.
5. Express the cost of renting a car from this agency *for 1 day* as a function of the number of kilometers driven. (**1** Point)
6. Draw the **graph** of this function (**2** Points)
7. How **much** does it cost to rent a car for a 1-day trip of 163 kilometers? (**1** Point)
8. The agency also offers a rental for a flat fee of **$ 125 per day**. How many kilometers must you drive on a 1-day trip for this to be a better deal? (**2** Points)

3) A furniture manufacturer can sell dining room tables for **$ 500** each. The manufacturer’s total cost consists of a fixed overhead of **$ 30,000** plus production costs of **$ 350** per table.

a) How many **tables** must the manufacturer sell to break even? (**2** Points)

b) How many **tables** must the manufacturer sell to make a profit of $ 6,000? (**1** Point)

1. What will be the manufacturer’s **profit** or **loss** if 150 tables are sold? (**1** Point)
2. On the same set of axes, **graph** the manufacturer’s total revenue and total cost functions. Explain how the **overhead cost** can be read from the graph. (**3** Points)
3. It costs a publisher $ 74,200 to prepare a book for publication (typesetting, illustrating, editing…); printing and binding costs are $ 5.50 per book. The book is sold to bookstores for $ 19.50 per copy.
4. Make a table showing the **cost** of producing 2,000 , 4,000 , 6,000 , and 8,000 books. (**1** Point)
5. Make a table showing the **revenue** of producing 2,000 , 4,000 , 6,000 , and 8,000 books? (**1** Point)
6. Write an **algebraic expression** representing the cost **y** as a function of the number of books **χ** that are produced. (**1** Point)
7. Write an **algebraic expression** representing the revenue **y** as a function of the number of books **χ** that are sold? (**1** Point)
8. **Graph** both functions on the same coordinate axes. (**3** Points)
9. Use the graph to determine how many **books** need to be made to produce revenue of at least **$ 85,000**. How much **profit** is earned for this number of books? (**2** Points)
10. Jamel, the organizer of a sports event, estimates that if the event is announced χ days in advance, the revenue obtained will be *R*(χ) thousand dollars, where

***R (χ*) = 400 + 120χ – χ2**

The cost of advertising the event for χ days is *C*(χ) thousand dollars, where

***C* (χ) = 2χ2 + 300**

1. Find the profit function **P (χ)** = R (χ) – C (χ), and **sketch the graph**. (**3** Points)
2. How many **days** in advance should Jamel announce the event to **maximize profit**? What is the **maximum profit**? (**2** Points)
3. What is the ratio of revenue to cost

***Q* (χ)** = *R* (χ) / *C* (χ)

at the optimal announcement time found in part (b)? What happens to this ratio as χ → 0? **Interpret** these results. (**2** Points)

1. In certain situations, it is necessary to weigh the benefit of pursuing a certain goal against the cost of achieving that very goal. For instance, suppose that to remove χ% of the population from an oil spill, it costs *C* thousands of dollars, where

***C* (χ) = 12χ / (100 – χ)**

1. How much does it **cost** to remove **25%** of the pollution? **50%**? (**2** Points)
2. Sketch the graph of the cost function. (**2** Points)
3. What happens as **χ → 100-**? Is it **possible** to remove **all** the pollution? (**2** Points)

**N.B**. Round your answers to the **nearest cent** for questions 2, 3, 4, 5 & 6.

**GOOD LUCK!**