04/01/20

**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: [(χ + 3) / (-5)] + [(y – 1) / 2] = 1
2. Find the **slope** and the **intercepts** of the line. (**3** Points)

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1. Sketch the graph of the line. (**2** Points)
2. For tax purposes, the book value of certain assets is determined by depreciating the original value of the asset **linearly** over a fixed period of time. Suppose an asset, originally worth ***V*** dollars, is linearly depreciated over a period of ***N*** years, at the end of which it has a scrap (salvage) value of ***S*** dollars.
3. Express the book value ***B*** of the asset ***t*** years into the ***N***-year depreciation period as a linear function of ***t***. [Hint: Note that ***B*** = ***V*** when ***t*** = **0** and ***B*** = ***S*** when ***t*** = ***N***.] (**4** Points)

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1. Suppose a $ 50,000 piece of office equipment is depreciated linearly over a 5-year period, with a scrap (salvage) value of $ 18,000. What is the **book value** of the equipment **after 3 years**? (**2** Points)

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3) Students at a state college may preregister for their fall classes by mail during the summer. Those who do not preregister must register in person in September. The registrar can process **35** students per hour during the September registration period. Suppose that after 4 hours in September, a total of **360** students (including those who preregistered) have been registered.

a) Express the number of students registered as a function of time and draw the graph. (**4** Points)

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b) How many students were registered after 3 hours? (**2** points)

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1. How many students preregistered during the summer? (**2** Points)

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1. Julia can sell a ceratin product for $ 110 per unit. Total cost consists of a fixed overhead of $ 7,500 and production costs of $ 60 per unit.
2. Express Julia’s **total revenue**, **total cost**, and **total profit** in terms of **χ**, the number of units sold. Sketch the *total revenue* and *total cost* functions on the same set of axes. (**5** Points)

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1. How many units must be sold for Julia to break even? (**2** Points)

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1. What is Julia’s profit **or** loss if *100 units are sold*? (**2** Points)

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1. How many **units** must be sold for Julia to realize a **profit of $ 1,250**? (**1** Point)

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1. Two species coexist in the same ecosystem. Species I has population ***P (t)*** in *t* years, while species II has population ***Q (t)***, both in thousands, where *P* and *Q* are modeled by the functions:

***P (t)* = 30 / (3 + *t*)** and ***Q (t)* = 64 / (4 – *t*)**

for all times t ≥ 0 for which the perspective populations are nonnegative.

1. What is the initial population of each specy? (**1** Point)

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1. What happens to ***P (t)*** as *t* increases? What happens to ***Q (t)*** as *t* increases? (**2** Points)

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1. Sketch the **graphs** of *P (t)* and *Q (t)* on the same set of axes. (**3** Points)
2. In 2010, the cost *p (χ)* in cents of mailing a letter weighting χ grams was:

$$p(x)=\left\{\begin{array}{c}44 if \&0<x\leq 1\\61 if 1<x\leq 2\\78 if \&2<x\leq 3.50\end{array}\right.$$

Sketch the graph of *p (χ)* for 0 < χ ≤ 3.50 with increments of 0.25 grams. For what values of χ is *p (χ)* continuous on the domain ]0 , 3.50]? (**5** Points)

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

**GOOD LUCK!**