



Strathmore
UNIVERSITY

STRATHMORE BUSINESS SCHOOL (SBS)
BACHELOR OF SUPPLY CHAIN MANAGEMENT
END OF SEMESTER EXAMINATION
MAT 1201 – BUSINESS MATHEMATICS

DATE: 21ST MARCH 2022

Time: 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

QUESTION ONE

- a) Perform the indicated operation and write your answer in the complex number standard form of $p + qi$ [4 Marks]
$$\frac{6 + 7i}{8 - 1}$$
- b) We need 100 liters of a 25% saline solution, and we only have a 14% solution and a 60% solution. How much of each should we mix to get the 100 liters of the 25% solution? [5 Marks]
- c) Solve each of the following inequality. Give the solution in both inequality and interval notations. $0 \leq 10w - 15 \leq 23$ [4 Marks]
- d) Determine if the given equation is a function $y = 14 - \frac{1}{3}x$ [3 Marks]
- e) Determine the domain of the function $g(w) = \sqrt{9w + 7}$ [3 Marks]

f) Find the inverse of the following function: $h(x) = 5 - 9x$ [4 Marks]

g) The population (in hundreds) of fish in a pond is given by

$$P(t) = 2t + \sin(2t - 10)$$

i. Using tables, calculate the rate of change as $t \rightarrow 5$ [5 Marks]

ii. Use the information from (i) to estimate the instantaneous rate of change of the population of the fish at $t = 5$ [2 Marks]

QUESTION TWO

a) We are starting with 5000 and we're going to put it into an account that earns an annual interest rate of 12%. How long should we leave the money in the account to double our money if interest is compounded

i. quarterly [5 Marks]

ii. monthly [5 Marks]

iii. continuously [5 Marks]

b) For the following systems of equations convert the system into an augmented matrix and use the augmented matrix techniques to determine the solution to the system or to determine if the system is inconsistent or dependent. [5 Marks]

$$x - 7y = -11$$

$$5x + 2y = -18$$

QUESTION THREE

a) In a business that deals with research for antibiotics, they have a laboratory that studies the bacteria for which the antibiotic is created. In an experiment, they found that a population of bacteria initially had 250 present and in 5 days there was be 1600 bacteria present.

i. Determine the exponential growth equation for this population. [7 Marks]

ii. How long will it take for the population to grow from its initial population of 250 to a population of 2000? [6 Marks]

b) Find the solution to the following systems of equations.

$$2x + 5y + 2z = -38$$

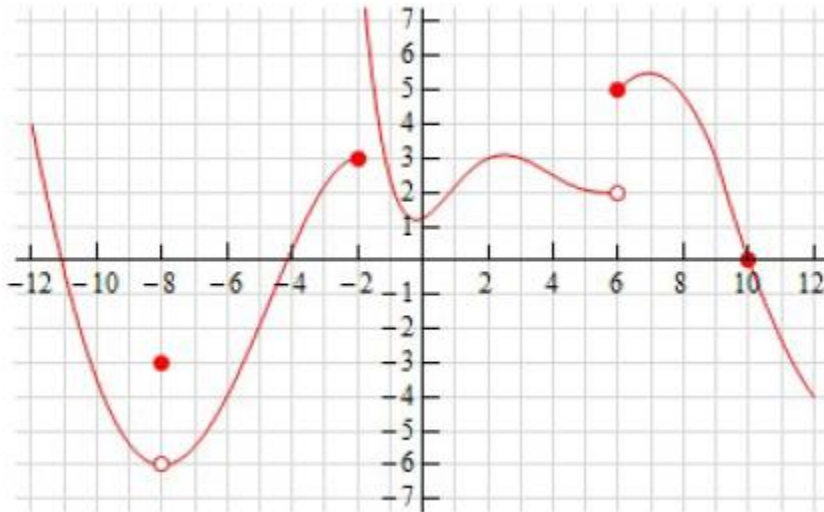
$$3x - 2y + 4z = 17$$

$$-6x + y - 7z = -12$$

[7 Marks]

QUESTION FOUR

- a) Calculate the following limit: $\lim_{x \rightarrow 0} \frac{x}{3 - \sqrt{x+9}}$ [4 Marks]
- b) Below is the graph of $f(x)$. For each of the given points determine the value of $f(a)$ and $\lim_{x \rightarrow a} f(x)$. If any of the quantities do not exist clearly explain why.



- i. $a = -8$ [4 Marks]
- ii. $a = -2$ [4 Marks]
- c) Evaluate the limits of the following piece-wise function and state whether the limit exists at the indicated cut-off points (boundaries) [4 Marks]
- $$f(x) = \begin{cases} 7 - 4x, & x < 1 \\ x^2 + 2x, & x \geq 1 \end{cases}$$
- d) Find the derivatives of the following function [4 Marks]

$$y = 10\sqrt[5]{x^3} - \sqrt{x^7} + 6\sqrt[3]{x^8} - 3$$

QUESTION FIVE

- a) Given $h(t) = 50 + 40t^3 - 5t^4 - 4t^5$, answer each of the following questions
- Identify the critical points of the function [3 Marks]
 - Classify the critical points as relative maximums, relative minimums or neither. [3 Marks]

- b) The production costs, in dollars, per week of producing x widgets is given by,

$$C(x) = 4,000 - 32x + 0.08x^2 + 0.00006x^3$$

And the demand function is given by:

$$p(x) = 250 + 0.02x - 0.001x^2$$

What is the marginal cost, marginal revenue, and marginal profit when $x = 200$ and when $x = 400$? What do these numbers tell you about the cost, revenue, and profit?
[14 Marks]