MCR3U Final Exam

Question Sheet

Name: _____ **Mark:** _____ **/ 100**

K&U	A	T	C
_____ / 30	_____ / 30	_____ / 20	_____ / 20

Part A: Knowledge - Multiple Choices (30 marks, 3 marks per each)

1. Which of the following relation can be considered as a function?
   A. {(15, 9), (18, 8), (18, 7), (20, 6)}
   B. {(5, 2), (5, 4), (8, 10), (9, 12)}
   C. {(1, 2), (3, 3), (5, 4), (7, 5)}
   D. {(-2, 5), (-1, 0), (0, 5), (0, 10)}

2. For the quadratic function $g(x)= -3(x-5)^2 + 2$, which of the following statements is NOT true?
   A. The graph of this function (parabola) opens downward.
   B. The vertex of this function is (5, 2).
   C. The axis of symmetry is x=5.
   D. The minimum value of this function is 2.

3. Which of the following statement describe the transformations in order that must be applied to obtain $g(x)= 3\times7^{(x+5)} + 2$ from the its parent function?
   A. vertical shift up 2 units, horizontal shift left 5 units, then vertically stretch by a factor of 3.
   B. horizontal stretch by a factor of 3, vertical shift up 2 units, then horizontal shift right 5 units.
   C. vertical stretch by a factor of 3, vertical shift up 2 units, then horizontal shift left 5 units.
   D. vertical shift up 2 units, horizontal shift right 5 units, then horizontal stretch by a factor of 3.

4. Which of the following equation represents the inverse of f(x) = 3 – 2x.

   A. $f^{-1}(x) = \frac{3-x}{2}$ B. $f^{-1}(x) = \frac{3+x}{2}$

   C. $f^{-1}(x) = 3 + 2x$ D. $f^{-1}(x) = 2x - 3$

5. For the exponential function $f(x) = 100(\frac{1}{5})^x$, which of the following statements is NOT true?
   A. The y-intercept is (0, 100)
   B. The graph of the function is ever increasing (as x increases).
   C. The domain is the set of all real numbers.
   D. The range is the set of real numbers greater than 0.

6. Find all possible angles θ between 0° and 360° that makes $\sec\theta = -\frac{2\sqrt{3}}{3}$.

   A. 150° B. 210°

   C. 150° and 210° D. 210° and 330°

7. Which of the following options lists the correct value of the term $t_{4,1}$ and $t_{6,4}$ in Pascal's triangle?
   A. 1; 10
   B. 1; 20
   C. 2; 10
   D. 4; 15

8. Find the second term in the expansion of $(2b + 1)^3$

A. $12b^2$ B. $6b$ C. $4b^2$ D. $8b^3$

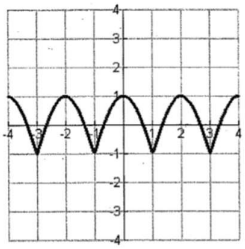
9. Which of the following formula is a correct representation of the sequence given below?

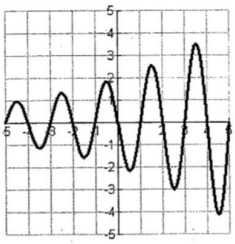
5, 0, -5, -10, - 15 …

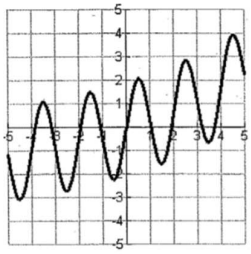
A. $t_n = 5 – 5n$ B. $t_n = t_{n-1} – 5, t_1 = 5$

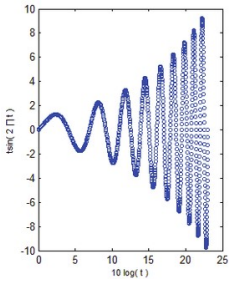
C. $t_n = –5^n$ D. $t_n = t_{n-1} – 5$

10. Which of the following is a periodic function?

A. 

B. 

C. 

D. 

Part B: Application - Fill in Blanks (30 marks, 3 marks per each)

- Apply what you have learned in this course to solve the following problems.
- The question requires mathematical calculations, so please show all of your work.

1. Given the function $f(t) = t^2 – 3t + 7$, determine $f(2a) =$_____.

2. Given the function $f(x) = 2|x – 1| + 2$, state its range: _____.

3. Simplify the following expressions:

1) $\frac{3x}{x-3} + \frac{2x}{x+3} =$ 2) $\left(\frac{a^3}{a^{-4}}\right)^{-2} =$ 3) $2\sqrt{6} \times 3\sqrt{8} =$

4. Given the angle of 250°, find

1) the smallest negative coterminal angle: _____

2) reference angle: _____

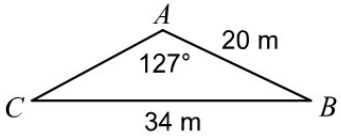
5. Without technology, evaluate tan 330° = _____. Please show your work.

6. For the function f(x) = 3 cos(2x), state its
   1) midline: _____
   2) y-intercept: _____

Part C: Thinking & Communication - Short Answers (40 marks, 20T + 20C)

- Apply what you have learned in this course to solve the following problems.
- The question requires mathematical calculations, so please show all of your work.

1. Given the oblique triangle below:
   1) Discuss in detail which of the following strategy is the most appropriate to solve this triangle (3 C):
      a. definitions of trigonometric ratios (SOH, CAH, TOA)
      b. sine law
      c. cosine law



   2) Find the measure of angle C and angle B. (4 T)

   3) Find the missing side AC. (2 T)

2. 1) Find zeros (roots) of the quadratic equation $y = -\frac{1}{2}x^2 - 4x - 6$ by completing the square. (3 T)

   2) Explain how zeros of quadratic equation $y = -\frac{1}{2}x^2 - 4x - 6$ is related to the graph of function $f(x) = -\frac{1}{2}x^2 - 4x - 6$. (3 C)

3. To buy a new phone, Jennifer borrows $800, which she plans to repay in 5 years. The bank charges 11% per year, compounded annually.
   1) Analyze and find the amount that Gaston must repay. (4 T)

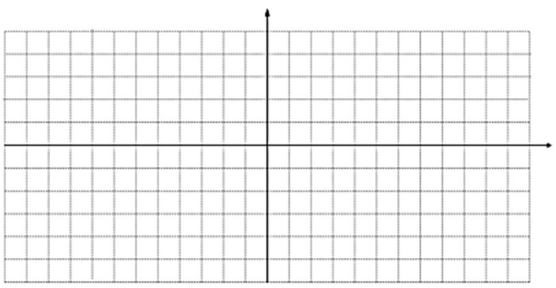
   2) Analyze and find how much total interest will Jenifer have to pay? (3 T)

   3) Discuss in detail the differences between simple interest and compound interest. (3 C)

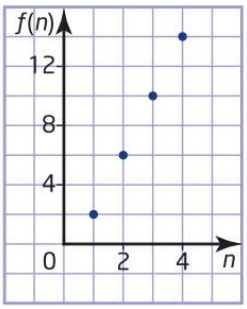
4. Given the function $g(x) = -10 \sin (x + 45°) - 2$
   1) Describe transformations of g(x) compared to its parent function in the correct order. (3C)

   2) Find the mapping rule. (2C)

   3) Sketch a graph g(x) on the interval $-180° \leqslant x \leqslant 360°$ by finding five original points and five transformed points. (3C)



5. Given the graphical representation of a sequence below:



1) Based on an analysis of the pattern being observed, find an explicit and recursion formula to algebreically represent this sequence respectively. (4 T)

2) Discuss in detail the differences between explicit formula and recursion formula in terms of representing a given sequence. (3 C)