



COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF MATHEMATICS
BASIC MATHEMATICS FOR NATURAL SCIENCES
MATH-101N
Final Examination

Time allowed: 2:30 minutes
Date of Exam: 04/06/2012 E.C
Total mark: 50%

⊗. Name _____ ID No. _____ sec _____ regular ☐

⊗. **GENERAL INSTRUCTIONS**

The exam consisting of 20 questions having 4- True/False, 7- Short answer, 5-choice, and 4-workout items into TWO pages.

- Before You are starting to do please fill all the above information correctly.
- **Write your answer on the answer sheet only, and don't mark on the question paper.**
- Students should maintain perfect silence in the examination hall.
- Students should not bring any electronic materials (mobile, laptop,...) to the exam hall.
- Write your name and ID card No. on each answer book and additional sheets if any.
- Nobody should leave the hall with out handling the answer book.
- **Cheating in the examination in any form is a serious offense.**

Part I: (True/False) (1.5 point each) (Say 'True' if the statement given is correct else 'False'):

1. A polynomial of degree n has at most $n - 1$ turning points.
2. Every declarative sentence is proposition.
3. The lines $l_1 : 2x - 3y + 3 = 0$ and $l_2 : 3x + 2y + 2 = 0$ are perpendicular.
4. The imaginary part of the complex number $(x + iy) \cdot (a + bi)$ is $(x + y)b$.

Part II: Short Answer (11 point) (Answer the following questions):

1. **(2 point)** The remainder when the polynomial $x^3 - 2x^2 + 3x - 2$ is divided by $x + 2$ is ____.
2. **(2 point)** The inverse of the function $f(x) = e^{\sqrt[3]{x+1}}$ is ____.
3. **(2 point)** Let $f(x) = x^3 - 2$, and $g(x) = \sqrt{2x - 1}$, then $(g \circ f)(2)$ is ____.
4. **(1 point each)** The period, amplitude and frequency of the function $\cos(\frac{5x}{2})$ are ____, ____, and ____ respectively.
5. **(2 point)** Given points $P = (-3, 5)$ and $Q = (2, 3)$, then the coordinates the point R on the line segment $\overline{PQ}$ in the ratio $2 : 1$ is ____.

⊗. **Part III: (2 point each) (Choose the best answer for the following questions:)**

1. Which of the following point is on the circle with center at the origin and radius $\sqrt{5}$?
A. $(\frac{3}{2}, \frac{3}{2})$ B. $(\sqrt{5}, \sqrt{5})$ C. $(5, 0)$ D. $(-1, -2)$
2. Which of the following expression is true about relation?
A. $\text{Domain}((R^{-1})^{-1}) = \text{Domain}(R^{-1})$. C. $\text{Range}(R) = \text{Range}(R^{-1})$.
B. $\text{Domain}(R) = \text{Range}(R^{-1})$. D. $\text{Domain}(R) = \text{Domain}(R^{-1})$.
3. Which of the following is true about the parabola $(y - 1)^2 = 12(x + 2)$?
A. The focus is $(4, -2)$. C. The focal length is 12.
B. It is vertical parabola. D. The directrix line is $x = 4$.
4. Which of the following is false about the power set of a set A .
A. $\emptyset \in P(A)$ B. $\{A\} \subseteq P(A)$ C. $A \subseteq P(A)$ D. $A \in P(A)$
5. Which of the following is incorrect about the function $f(x) = \tanh(x)$?
A. Horizontal asymptote $y = \pm 1$ C. $\text{Range}(f) = (-1, 1)$
B. $\text{Domain}(f) = \mathbb{R}$ D. Vertical asymptote $x = \pm 1$
6. Given $f(x) = 3^x$, then for what value of x , $\frac{f(x+2)-f(2)}{2} = 4(3^x)$?
A. 2 B. 3 C. -3 D. -2

Part IV: Workout: (Show all necessary steps neatly and clearly:)

1. (6 point) Determine center, foci, vertices, eccentricity, asymptotes, axes, and sketch the graph of the hyperbola $2x^2 - 3y^2 - 4x + 12y + 8 = 0$.
2. (5 point) Find the remaining zeros of the polynomial $P(x) = 4x^3 - x^2 - 36x + 9$ if $P(\frac{1}{4}) = 0$.
3. (4 point) Determine the equation of the circle containing points $(-2, 0)$, $(2, 0)$, and $(0, 4)$.
4. (6 point) Find the domain, range, intercepts, asymptotes, and sketch the graph of the function $f(x) = \frac{x^2}{x^2 - 4}$.