

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	206/4	All	
Examination	Date	Time	Pages
Final	April 2010	3 Hours	2
Instructors	Course Examiner		
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Special Instructions			
▷ Only approved calculators are allowed.			

MARKS

- [4] 1. Simplify the expressions below. Do not use a calculator.

(a) $-\sqrt{64} + 8\sqrt{36} - 3\sqrt{144}$ (b) $\log_2 20 - \log_2 45 + \log_2 36$

- [4] 2. Rationalize the denominator:

(a) $\frac{2 - \sqrt{5}}{2 + 3\sqrt{5}}$ (b) $\frac{\sqrt{3}}{5 - \sqrt{2}}$

- [6] 3. Simplify the expressions:

(a) $8(1 - x^3) + 4(1 + x + x^2 + x^3)$ (b) $\frac{x - x^2}{x^2 + x - 2}$

- [8] 4. Factor the polynomials completely:

(a) $6x^2 + 8x + 2$ (b) $2 - 8x^2$

- [4] 5. Perform the arithmetic operations and simplify:

$$\frac{x}{x^2 + x} - \frac{x + 4}{x^2 + 2x + 1}$$

- [9] 6. Solve the equations:

(a) $\frac{2x}{x^2 - 4} + \frac{3}{x + 2} = \frac{4}{x^2 - 4}$ (b) $\log_5 x + \log_5 (x - 4) = \log_5 (x + 6)$

(c) $4^{1-2x} = 2$

- [8] 7. Solve the inequalities, express your answer using set notation or interval notation:

(a) $2 \leq 3x + 7 < 13$ (b) $|1 - 4x| - 7 < -2$

- [4] 8. Solve the system of equations:

$$\begin{aligned}2x^2 + y^2 &= 1 \\2x - y &= -1\end{aligned}$$

- [8] 9. (a) Which of the points $A(4, 2)$, $B(3, 5)$ is closer to the point $C(2, 5)$?

(b) Show that the equation $x^2 + y^2 - 2x - 4y - 4 = 0$ represents a circle. Find coordinates of the center and radius of the circle.

- [6] 10. Find the domain and range of the functions (do not graph):

$$(a) f(x) = \frac{x}{x^3 - 8} \quad (b) g(x) = -\sqrt{x+3} \quad (c) h(x) = |x| - 4$$

- [5] 11. Sketch the graph of the function $f(x) = -\ln(x-2)$, starting from the graph of the function $g(x) = \ln x$ and using appropriate transformations.

- [8] 12. Let $f(x) = \frac{2x}{x+3}$ and $g(x) = 3-x$. Find:

$$(a) fg \quad (b) \frac{f}{g} \quad (c) f \circ g \quad (d) g \circ f$$

- [8] 13. (a) Find the inverse of the function $f(x) = \frac{3x+4}{2x-3}$.

(b) Find the vertical and horizontal asymptotes of both f and f^{-1} above.

- [5] 14. Sandra, who is paid one and a half time for hours worked in excess of 40 hours, had gross weekly wages of \$442 for 48 hours worked. What is her regular hourly rate?

- [5] 15. The area of a rectangular window is to be 143 square feet. If the length is to be 2 feet more than the width, what are the dimensions?

- [8] 16. The size P of a certain insect population at time t (in days) obeys the function $P(t) = 500e^{0.02t}$.

- (a) Determine the initial amount of insect.
(b) When will the insect population double?
(c) When will the insect population reach 800?