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**
I. Abdelrazeq, J. Li, J. Parks, N. Donfrancesco			D. Sen

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

[6] **3.** Simplify the expressions:

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

[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) $\dfrac{2x}{x^2-4}+\dfrac{3}{x+2}=\dfrac{4}{x^2-4}$ (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) $2\le 3x+7<13$ (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) $f(x) = \dfrac{x}{x^3 - 8}$ (b) $g(x) = -\sqrt{x+3}$ (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 $f(x) = \dfrac{2x}{x+3}$ and $g(x) = 3 - x$. Find:

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

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

(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?