CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	206/2		All
Examination	**Date**	**Time**	**Pages**
Final	December 2011	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) $-4\sqrt{27}+\sqrt{12}+3\sqrt{75}$ (b) $\frac{2}{3}\log_2 8-\log_2(3^2-1)$

[4] **2.** Rationalize the denominator:

(a) $\frac{\sqrt{2}}{\sqrt{7}+2}$ (b) $\frac{2+\sqrt{3}}{2-\sqrt{3}}$

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

(a) $x(8x^3-2x^2+6x-2)+5x(3x^4-2x^3+x^2+x)$ (b) $\frac{x^2+4x-5}{x^2-2x+1}$

[8] **4.** Factor the polynomials completely:

(a) $6x^2+8x+2$ (b) $1-x^4$

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

$$\frac{3}{x^2+x}-\frac{x+4}{x^2+2x+1}$$

[9] **6.** Solve the equations:

(a) $\frac{5}{x+4}=4+\frac{3}{x-2}$ (b) $\log_2(x+6)-\log_2(x-4)=\log_2 x$

(c) $3^{x^2-7}=(27)^{2x}$

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

(a) $0<\frac{3x+2}{2}<4$ (b) $3-|x+1|<\frac{1}{2}$

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

$$\begin{aligned} x^2 + y^2 &= 13 \\ x^2 - y &= 7 \end{aligned}$$

[8] **9.** (a) Which of the points $A(3,2)$, $B(5,3)$ is closer to the point $C(2,7)$?

(b) Show that the equation $x^2 + y^2 + 4x - 6y + 12 = 0$ 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) $f(x) = \dfrac{x}{x^2 + 2x - 3}$ (b) $g(x) = \sqrt{2 - x}$ (c) $h(x) = |x^2 - 4|$

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

[8] **12.** Let $f(x) = \dfrac{x-5}{x+1}$ and $g(x) = \dfrac{x+2}{x-3}$. 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.** A bank loaned out \$48,000, part of it at the rate of 8% per year and the rest at the rate of 18% per year. If the interest received totaled \$4000, how much was loaned at 8%?

[5] **15.** The length of fence required to enclose a rectangular field is 1500 meters. What are the dimensions of the field if it is known that the difference between its length and width is 25 meters?

[8] **16.** Fruit flies are placed in a half-pint milk bottle with a banana (for food) and yeast plants (for food and to provide a stimulus to lay eggs). Suppose that the fruit fly population after t days is given by

$$P(t) = \frac{230}{1 + 56.5e^{-0.37t}}$$

(a) Determine the initial population.

(b) What is the population after 5 days?

(c) How long does it take for the population to reach 180?