CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	206/1		All
Examination	**Date**	**Time**	**Pages**
Final	June 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) $-4\sqrt{18}+\sqrt{2}+3\sqrt{50}$ (b) $\frac{3}{2}\log_3 9-\log_3(3^3-18)$

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

(a) $\dfrac{\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ (b) $\dfrac{1-\sqrt{7}}{1+\sqrt{7}}$

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

(a) $(7x^3-2x^2+9x-1)+5(3x^5-2x^4+2x^3-x)$ (b) $\dfrac{x^2-25}{x^2-4x-5}$

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

(a) $3x^2+10x+8$ (b) $2-8x^2$

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

$$\frac{x}{x-3}-\frac{x+1}{x^2+5x-24}$$

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

(a) $\dfrac{2x}{x^2-4}=\dfrac{4}{x^2-4}-\dfrac{3}{x+2}$ (b) $\log_2(x+2)=1-\log_2(x+3)$

(c) $5^{x^2-7}=(125)^{2x}$

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

(a) $0\le 1-\frac{1}{3}x\le 1$ (b) $-|2x-1|>-3$

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

$$\begin{aligned} x^2 + y^2 &= 25 \\ x + y &= 2 \end{aligned}$$

[8] **9.** (a) Which of the points $A(1,2)$, $B(2,3)$ is closer to the point $C(2,7)$?

(b) Show that the equation $x^2 + y^2 + 6x - 4y - 3 = 0$ 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) $f(x) = \dfrac{2x}{x^2 - 16}$ (b) $g(x) = -\sqrt{2x - 1}$ (c) $h(x) = 3|x| - 2$

[5] **11.** Sketch the graph of the function $f(x) = 5 - \log(x - 3)$, starting from the graph of the function $g(x) = \log x$ and using appropriate transformations.

[8] **12.** Let $f(x) = \dfrac{x-1}{x+2}$ and $g(x) = \dfrac{3x-4}{x+3}$. Find:

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

[8] **13.** (a) Find the inverse of the function $f(x) = \dfrac{x+1}{2x-3}$.

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

[5] **14.** Wendy, a loan officer at a bank, has \$1,000,000 to lend and is required to obtain an average return of 18% per year. If she can lend at the rate of 19% or at the rate of 16%, how much can she lend at the 16% and and still meet her requirement?

[5] **15.** The area of a rectangular window is to be 306 square centimeters. If the length exceeds the width by 1 centimeter, what are the dimensions?

[8] **16.** Iodine 131 is a radioactive material that decays according to the function

$$A(t) = A_0 e^{-0.87t},$$

where A_0 is the initial amount present and A is the amount present at the time t (in days). Assume that a scientist has a sample of 100 grams of iodine 131.

(a) How much iodine 131 is left after 9 days?

(b) When will 70 grams of iodine 131 be left?

(c) What is the half-life of iodine 131?