CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	206/4	All
Examination	**Date**	**Pages**
Final	April 2008	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) $\sqrt{200} - \sqrt{128} + \sqrt{72}$ (b) $\frac{1}{3}\log_5 8 + \log_5(3^4 - 8)$

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

(a) $\frac{5}{4\sqrt{2}}$ (b) $\frac{\sqrt{2}}{\sqrt{7}+2}$

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

(a) $6(x^3 + x^2 - 3) - 4(2x^3 - 3x^2)$ (b) $\frac{4y^2 + 8y}{12y + 24}$

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

(a) $x^4 + 11x^3 + 30x^2$ (b) $x^4 - 81$

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

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

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

(a) $\frac{x}{x^2-1} - \frac{x+3}{x^2-x} = \frac{-3}{x^2+x}$ (b) $\log_4(x^2-9) - \log_4(x+3) = 3$ (c) $5 \cdot 5^x = 125$

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

(a) $3x + 4 > \frac{1}{3}(x - 2)$ (b) $|x + 4| + 3 < 5$

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

$$\begin{aligned} x^2 - y^2 &= 21 \\ x + y &= 7 \end{aligned}$$

[8] **9.** (a) Which of the points $A(1,3)$, $B(-1,-2)$ is closer to the point $C(2,0)$?

(b) Show that the equation $x^2 + y^2 + 4x - 4y - 1 = 0$ 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) $f(x) = \dfrac{x}{x^4 - 1}$ (b) $g(x) = \sqrt{3x - 12}$ (c) $h(x) = \dfrac{1}{2}|x|$

[5] **11.** Sketch the graph of the function $f(x) = 3\log(x-1)$, starting from the graph of the function $g(x) = \log x$ and using appropriate transformations.

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

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

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

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

[5] **14.** A bank loaned out \$12,000, 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 \$1000, how much was loaned at 8%?

[5] **15.** A movie theater charges \$9.00 for adults and \$7.00 for senior citizens. On a day when 325 people paid an admission, the total receipts were \$2495. How many who paid were adults? How many were seniors?

[8] **16.** A colony of bacteria that grows according to the law of uninhibited growth is modeled by the function

$$N(t) = 100e^{0.045t}$$

where N is measured in grams and t is measured in days.

(a) What is the population after 5 days?

(b) How long will it take for population to reach 140 grams?

(c) What is the doubling time for the population?