CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	206/2		All
Examination	**Date**	**Time**	**Pages**
Final	December 2012	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) $-4\sqrt{32}+5\sqrt{18}-3\sqrt{72}$ (b) $\log_2 20-\log_2(7^2-19)+\log_2 12$

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

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

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

(a) $8(8x^3-2x^2-2)+5x(3x^4-2x^3+x^2+x)$ (b) $\dfrac{x^2-25}{x^2-4x-5}$

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

(a) $3x^2-10x+8$ (b) $64-27x^3$

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

$$\frac{2x-3}{x^2+8x+7}-\frac{x-2}{x^2+2x+1}$$

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

(a) $\dfrac{4(x-2)}{x-3}+\dfrac{3}{x}=\dfrac{-3}{x(x-3)}$ (b) $\log_3(x+1)+\log_3(x+4)=2$

(c) $5^{x^2+8}=(125)^{2x}$

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

(a) $2<\dfrac{3-3x}{12}<6$ (b) $5-|x-1|>\dfrac{1}{2}$

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

$$\begin{aligned} x^2 + y^2 &= 16 \\ x^2 - 2y &= 8 \end{aligned}$$

[8] **9.** (a) Which of the points $A(1,2)$, $B(5,3)$ is closer to the point $C(2,6)$?

(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) $f(x) = \dfrac{2}{(2-x)^2}$ (b) $g(x) = \sqrt{x+2}$ (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 $f(x) = \dfrac{x}{x+3}$ and $g(x) = \dfrac{2}{x}$. Find:

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

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

(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 15%~~, how much can she lend at the rate of 19% and at the rate of 16% and still meet her requirement?

[5] **15.** Shannon grossed $435 one week by working 52 hours. Her employer pays time-and a-half for all hours worked in access of 40 hours. How much Shannon's regular hourly wage?

[8] **16.** The EFISCEN wood products model classifies wood products according to their life-span. Based on data obtained from the European Forest Institute, the percentage of wood products after t years with long life-spans is given by

$$P(t) = \frac{100.3952}{1 + 0.0317e^{0.0581t}}$$

(a) What is the decay rate?

(b) What is the percentage of remaining wood products after 10 years?

(c) How long does it take for the percentage of wood products to reach 50%?