CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number		Section(s)
Mathematics	206/2		All
Examination	**Date**	**Time**	**Pages**
Final	December 2009	3 Hours	2
Instructors			**Course Examiner**
A. Hariton, C. Lefebvre, E. Duma, H. Greenspan, M. Tziritas			D. Sen

Special Instructions

▷ **Only approved calculators are allowed.**

MARKS

[4] **1.** Simplify the expressions below. Do not use a calculator.

(a) $-\sqrt{32}+8\sqrt{18}-3\sqrt{72}$ (b) $\log_2 10-\log_2 15+\log_2 12$

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

(a) $\dfrac{1}{2-\sqrt{3}}$ (b) $\dfrac{\sqrt{2}}{\sqrt{10}-3}$

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

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

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

(a) $6x^2+x-2$ (b) $3-27x^2$

[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) $\dfrac{x}{x-2}+\dfrac{2}{x+1}=\dfrac{7x+1}{x^2-x-2}$ (b) $\log_5(x+6)+\log_5(x+2)=1$

(c) $9^{2x}=27^{3x-4}$

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

(a) $4-3(1-x)\leq 3$ (b) $|1-2x|-4<-1$

[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 $A(3,2)$, $B(2,5)$ is closer to the point $C(1,5)$?

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

[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 $f(x) = \dfrac{x - 5}{x + 1}$ 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 $f(x) = \dfrac{2x + 3}{x + 2}$.

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

[5] **14.** A restaurant manager wants to purchase 200 sets of dishes. One design costs \$25 per set, while another costs \$45 per set. If she only has \$7400 to spend, how many of each design should be ordered??

[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.** The number N of bacteria present in a culture at time t (in hours) obeys the law of uninhibited growth $N(t) = 1000e^{0.01t}$

(a) Determine the initial amount of bacteria.

(b) When will the number of bacteria double?

(c) When will the number of bacteria reach 1700?

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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?

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Mathematics	206/2		All
Examination	**Date**	**Time**	**Pages**
Final	December 2010	3 Hours	2
Instructors			**Course Examiner**
A. Prats Ferrer, I. Dakov, O. Quijano Xacur, Z. Lazar			D. Sen

Special Instructions

▷ **Only approved calculators are allowed.**

MARKS

[4] **1.** Simplify the expressions below. Do not use a calculator.

(a) $\sqrt{48} - \sqrt{147} + \sqrt{27}$ (b) $\log_3 15 + \log_3 4 - \log_3 20$

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

(a) $\dfrac{5}{4\sqrt{2}}$ (b) $\dfrac{-5}{\sqrt{5}+2}$

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

(a) $(x-1)^3 + x(x-2)(x+2)$ (b) $\dfrac{3x-15}{x^2-8x+15}$

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

(a) $x^4 + 2x^3 - 8x^2$ (b) $x^5 - 81x$

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

$$\frac{5}{x^2+x-6} + \frac{1}{x+3}$$

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

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

(c) $4^{x+1} = 64$

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

(a) $-5 \leq \dfrac{x+1}{2} \leq 10$ (b) $|2x-1| \leq 1$

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

$$\begin{aligned} x^2 + y^2 &= 5 \\ x^2 - 2y^2 &= 2 \end{aligned}$$

[8] **9.** (a) Which of the points $A(1,-2)$, $B(-2,5)$ is closer to the point $C(0,2)$?

(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) $f(x) = \dfrac{1}{(x-4)^2}$ (b) $g(x) = \sqrt{36 - x^2}$ (c) $h(x) = 1 - |x+4|$

[5] **11.** Sketch the graph of the function $f(x) = -2\ln(x+1)$, starting from the graph of the function $g(x) = \ln x$ and using appropriate transformations.

[8] **12.** Let $f(x) = \dfrac{x+4}{3}$ and $g(x) = 3x - 4$. 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 total of \$18,000 is invested, some in stocks and some in bonds. If the amount invested in bonds is half that invested in stocks, how much is invested in each category?

[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

$$A(t) = A_0 e^{-0.087t}$$

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

(a) What is the decay rate of iodine 131?

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

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

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Mathematics	206/4		All
Examination	**Date**	**Time**	**Pages**
Final	April 2011	3 Hours	2
Instructors			**Course Examiner**
A. MacKay, C. Poisson, H. Faridian, M. Najafi Ivaki			D. Sen

Special Instructions

▷ **Only approved calculators are allowed.**

MARKS

[4] **1.** Simplify the expressions below. Do not use a calculator.

(a) $-8\sqrt{12}+\sqrt{3}+3\sqrt{75}$ (b) $\frac{2}{3}\log_2 8-\log_2(2^4-8)$

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

(a) $\dfrac{\sqrt{2}}{\sqrt{3}-3\sqrt{2}}$ (b) $\dfrac{1+\sqrt{5}}{1-\sqrt{5}}$

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

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

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

(a) $3x^2+12x-15$ (b) $3-27x^2$

[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) $\dfrac{x}{x^2-1}-\dfrac{x+3}{x^2-x}=\dfrac{-3}{x^2+x}$ (b) $\log_8 x+6=1-\log_8(x+4)$

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

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

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

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

$$\begin{aligned} x^2 + y^2 &= 36 \\ x + y &= 8 \end{aligned}$$

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

(b) Show that the equation $x^2 + y^2 - x + 2y + 1 = 0$ 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) $f(x) = \dfrac{x}{x^2 - 9}$ (b) $g(x) = -\sqrt{x+3}$ (c) $h(x) = |x| + 4$

[5] **11.** Sketch the graph of the function $f(x) = 2 - \log(x+1)$, starting from the graph of the function $g(x) = \log x$ and using appropriate transformations.

[8] **12.** Let $f(x) = \dfrac{2x-1}{x-2}$ and $g(x) = \dfrac{x+4}{2x-5}$. Find:

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

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

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

[5] **14.** Candy has \$70,000 to invest and requires an overall rate of return of 9%. She can invest in a safe, government-insured certificate of deposit, but it only pays 8%. To obtain 9%, she agrees to invest some of her money in non-insured corporate bonds paying 12%. How much should be placed in each investment to achieve her goal?

[5] **15.** The perimeter of a rectangle is 60 feet. Find its length and width if the length is 8 feet longer than the width.

[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) Determine the initial amount of bacteria.

(b) How long will it take for population to reach 180 grams?

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