

CONCORDIA UNIVERSITY  
Department of Mathematics & Statistics

Course	Number	Section(s)	
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)  $\frac{5}{4\sqrt{2}}$       (b)  $\frac{-5}{\sqrt{5} + 2}$
- [6] 3. Simplify the expressions:
- (a)  $(x - 1)^3 + x(x - 2)(x + 2)$       (b)  $\frac{3x - 15}{x^2 - 8x + 15}$
- [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)  $\frac{2x}{x^2 - 4} + \frac{3}{x + 2} = \frac{4}{x^2 - 4}$       (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)  $-5 \leq \frac{x + 1}{2} \leq 10$       (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):

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

- [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  $f(x) = \frac{x+4}{3}$  and  $g(x) = 3x-4$ . Find:

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

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

(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?

CONCORDIA UNIVERSITY  
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Course	Number	Section(s)	
Mathematics	206/1	All	
Examination	Date	Time	Pages
Final	June 2010	3 Hours	2
Instructors	Course Examiner		
J. Parks	D. Sen		
Special Instructions			
▷ Only approved calculators are allowed.			

MARKS

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

(a)  $3\sqrt{5} + \sqrt{80} - 2\sqrt{20}$       (b)  $\frac{1}{4} \log_3 81 - \log_3(3^3 - 18)$

[4] 2. Rationalize the denominator:

(a)  $\frac{6}{4\sqrt{3}}$       (b)  $\frac{\sqrt{3}}{5 - \sqrt{2}}$

[6] 3. Simplify the expressions:

(a)  $(7x^3 - 2x^2 + 6x - 2) - 3(2x^3 + x^2 + 4x)$       (b)  $\frac{x^2 + 2x}{12x + 24}$

[8] 4. Factor the polynomials completely:

(a)  $3x^2 - 2x - 8$       (b)  $x^4 - 1$

[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)  $5^{x^2+8} = 125^{2x}$     (b)  $\log(x) + \log(x-4) = \log(x+6)$     (c)  $2 \log_5(x) = \log_5(9)$

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

(a)  $4x + 7 \geq 2x - 3$       (b)  $|1 - 2x| - 4 < -1$

- [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  $A(1,4)$ ,  $B(4,6)$  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):

$$(a) f(x) = \frac{x}{x^2 - 9} \quad (b) g(x) = \sqrt{x - 1} \quad (c) h(x) = |x| - 4$$

- [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  $f(x) = \frac{3}{x - 1}$  and  $g(x) = \frac{2}{x}$ . Find:

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

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

- (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. The perimeter of a rectangular window is 42 meters. Find its length and width if the length is twice the width.

- [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 population to reach 180?

CONCORDIA UNIVERSITY  
Department of Mathematics & Statistics

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

- [6] 3. Simplify the expressions:

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

- [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)  $\frac{2x}{x^2 - 4} + \frac{3}{x + 2} = \frac{4}{x^2 - 4}$       (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)  $2 \leq 3x + 7 < 13$       (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):

$$(a) f(x) = \frac{x}{x^3 - 8} \quad (b) g(x) = -\sqrt{x+3} \quad (c) h(x) = |x| - 4$$

- [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  $f(x) = \frac{2x}{x+3}$  and  $g(x) = 3-x$ . Find:

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

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

- (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?

CONCORDIA UNIVERSITY  
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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)  $\frac{1}{2 - \sqrt{3}}$       (b)  $\frac{\sqrt{2}}{\sqrt{10} - 3}$
- [6] 3. Simplify the expressions:
- (a)  $6(x^3 + x^2 - 3) - 4(2x^3 - 3x^2 - 4)$       (b)  $\frac{4x^2 + 8x}{12x + 24}$
- [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)  $\frac{x}{x-2} + \frac{2}{x+1} = \frac{7x+1}{x^2-x-2}$       (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):

$$(a) f(x) = \frac{2x}{x^2 - 4} \quad (b) g(x) = \sqrt{x - 1} \quad (c) h(x) = -2|x|$$

- [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  $f(x) = \frac{x - 5}{x + 1}$  and  $g(x) = \frac{x + 2}{x - 3}$ . Find:

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

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

- (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?

CONCORDIA UNIVERSITY  
Department of Mathematics & Statistics

Course	Number	Section(s)
Mathematics	206	All
Examination	Date	Pages
Final	June 2009 (1)	2
Instructors	Course Examiner	
J. Li	D. Sen	
Special Instructions		
▷ Only approved calculators are allowed.		

MARKS

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

(a)  $\sqrt{32} + \sqrt{18} - \sqrt{72}$       (b)  $\frac{2}{3} \log_2 64 - \log_3(3^3 - 18)$

[4] 2. Rationalize the denominator:

(a)  $\frac{2}{\sqrt{12}}$       (b)  $\frac{\sqrt{2}}{\sqrt{5} + 2}$

[6] 3. Simplify the expressions:

(a)  $(x + 1)^3 + x(x - 2)(x + 2)$       (b)  $\frac{2x + 3y}{12x - 12y}$

[8] 4. Factor the polynomials completely:

(a)  $x^4 + 2x^3 - 8x^2$       (b)  $x^4 - 9x^2$

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

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

[9] 6. Solve the equations:

(a)  $\frac{2x}{x^2 - 4} = \frac{4}{x^2 - 4} - \frac{3}{x + 2}$       (b)  $\log x + \log(x - 4) = \log(x + 6)$       (c)  $5 \cdot 5^{x-2} = 125$

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

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

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

$$x^2 + y^2 = 13$$

$$x^2 - y = 7$$

- [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)  $f(x) = \frac{2x}{x^2 - 4}$

(b)  $g(x) = \sqrt{3x - 12}$

(c)  $h(x) = 1 - |x + 8|$

- [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  $f(x) = \frac{x}{x - 1}$  and  $g(x) = -\frac{4}{x}$ . Find:

(a)  $fg$

(b)  $\frac{f}{g}$

(c)  $f \circ g$

(d)  $g \circ f$

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

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

- [5] 14. A bank loaned out \$14,000, part of it at the rate of 4% per year and the rest at the rate of 12% per year. If the interest received totaled \$1000, how much was loaned at 4%?

- [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. 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 number of bacteria at  $t = 0$  hours.  
(b) What is the growth rate of the bacteria?  
(c) When will the number of bacteria reach 1700?