

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

Course	Number	Section(s)	
Mathematics	206/2	All	
Examination	Date	Time	Pages
Final	December 2014	3 Hours	2
Instructors	Course Examiner		
A. Bellahmid, E. Cyrenne, M. Padamadan, R. Mearns, T. Hughes	D. Sen		

Special Instructions

▷ Only approved calculators are allowed.

MARKS

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

(a) $-4\sqrt{50} - \sqrt{98} + 3\sqrt{32}$ (b) $\log_2 20 - \log_2 30 + \log_2 12$

[4] 2. Rationalize the denominator:

(a) $\frac{\sqrt{2}}{\sqrt{7} + 2}$ (b) $\frac{\sqrt{3} - 1}{2\sqrt{3} + 3}$

[6] 3. Simplify the expressions:

(a) $8x^2(4x^3 - 3x^2 - 4) - 4x(4x^4 - 4x^3 + 2x^2 + 7x)$ (b) $\frac{x^2 - x - 2}{3x^2 + 5x + 2}$

[8] 4. Factor the polynomials completely:

(a) $x^3 + 8x^2 - 20x$ (b) $x^8 - x^5$

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

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

[9] 6. Solve the equations:

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

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

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

(a) $-3 \leq \frac{5 - 3x}{2} \leq 6$ (b) $1 - \left| \frac{2x - 1}{3} \right| < -2$

- [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 $A(5, 6)$, $B(6, 4)$ is closer to the point $C(7, 8)$?
(b) Show that the equation $2x^2 + 2y^2 - 12x + 8y - 24 = 0$ 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) $f(x) = \frac{x+4}{x^3-4x}$ (b) $g(x) = \sqrt{(1-x)+2}$ (c) $h(x) = 3|x+1|-3$
- [5] 11. Sketch the graph of the function $f(x) = \log(x+2) + 3$, starting from the graph of the function $g(x) = \log x$ and using appropriate transformations.
- [8] 12. Let $f(x) = \frac{2x-1}{x-2}$ and $g(x) = \frac{x+4}{2x-5}$. Find:
- (a) fg (b) $\frac{f}{g}$ (c) $f \circ g$ (d) $g \circ f$
- [8] 13. (a) Find the inverse of the function $f(x) = \frac{2x-3}{x+4}$.
(b) Find the vertical and horizontal asymptotes of both f and f^{-1} above.
- [5] 14. A candy store sells boxes of candy containing caramels and cremes. Each box sells for \$12.50 and holds 30 pieces of candy (all pieces are the same size). If the caramels cost \$0.25 to produce and the cremes cost \$0.45 to produce, how many of each should be in a box to make a profit of \$3?
- [5] 15. An artist has 51 inches of oak trim to frame a painting. The frame is to have a border 3 inches wide surrounding the painting. If the painting is rectangular with a length twice its width, what are the dimensions of the painting?
- [8] 16. The mass $m(t)$ remaining after t days from a 40 gm sample of thorium-234 is given by,
- $$m(t) = 40e^{-0.0277t}$$
- (a) How much of the sample will remain after 60 days?
(b) After how long will only 10 gm of the sample remain?
(c) Find the half life of thorium-234.

COPYRIGHT

The present document and the contents thereof are the property and copyright of the professor(s) who prepared this exam at Concordia University. No part of the present document may be used for any purpose other than research or teaching purposes at Concordia University. Furthermore, no part of the present document may be sold, reproduced, republished or re-disseminated in any manner or form without the prior written permission of its owner and copyright holder.