

CONCORDIA UNIVERSITY
Department of Mathematics & Statistics

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|----------------------|-----------------|------------|
| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | April 2009 | 2 |
| Instructors | Course Examiner | |
| C. Cummins, J. Ruddy | E. Cohen | |

Special Instructions:

- ▷ Only approved calculators are allowed.
- ▷ Justify and explain all your answers.

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^4 - 2x^3 + 7x^2 + 6x - 5$ is divided by $g(x) = x - \frac{1}{2}$.
- [7] (b) Find an upper integral bound and a lower integral bound for the real zeros of the polynomial $2x^3 - 5x^2 - 10x - 25$, using the Theorem on Bounds.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $-x^4 + 2x^2 - x + 7$
- [7] (b) Show by Mathematical Induction that $1 + 4 + 7 + \dots + (3n - 2) = \frac{3n^2 - n}{2}$
- [7] 3. (a) Write the series $3 - 6 + 12 - 24 + 48 - 96$ using the summation notation (Σ).
- [7] (b) Find the sum of the arithmetic series $\sum_{k=1}^{200} (3k + 4)$.

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- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{-x}{x^2 - 4}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(-\frac{\sqrt{2}}{2} + \frac{i\sqrt{2}}{2}\right)^{50}$ in the form $a + bi$.
- [7] 5. (a) Compute the 4 fourth-roots of $\frac{\sqrt{3}}{2} - \frac{i}{2}$.
- [7] (b) Find a real polynomial of least degree having $1 + i$, 2 , $-i$ as roots.
- [8] 6. (a) Express the number $5.314314314\dots$ in the form $\frac{a}{b}$, where a, b are integers and $b \neq 0$.
- [8] (b) Find and simplify the coefficient of $a^{12}b^{25}$ in the expression $(a + b)^{37}$.
- [7] 7. (a) How many hands of 13 cards containing all 4 aces can be dealt from a 52-card deck?
- [7] (b) A store has 6 good computers and 3 defective computers. In how many ways can 4 computers be chosen so that 2 are defective?

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| Course | Number | Section(s) |
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| Mathematics | 202 | All |
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| Final | April 2008 | 2 |
| Instructors | Course Examiner | |
| L. Dube, B. Rhodes | E. Cohen | |

Special Instructions:

- ▷ Only approved calculators are allowed.
- ▷ Justify and explain all your answers.

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^3 - 7x^2 + 4x + 8$ is divided by $g(x) = x - \left(\frac{3}{2}\right)$.
- [7] (b) Find an upper integral bound and a lower integral bound for the real zeros of the polynomial $x^3 + 5x^2 - 6x - 30$, using the Theorem on Bounds.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $-x^5 + 2x^4 - x^2 - 1$
- [7] (b) Show by Mathematical Induction that
$$\left(1 - \frac{1}{4}\right) \left(1 - \frac{1}{9}\right) \left(1 - \frac{1}{16}\right) \dots \left(1 - \frac{1}{n^2}\right) = \frac{n+1}{2n}, \text{ for } n \geq 2$$
- [7] 3. (a) Write the series $60 - 15 + \frac{15}{4} - \frac{15}{16} + \frac{15}{64} - \frac{15}{256}$ using the summation notation (\sum).
- [7] (b) Find the sum of the arithmetic series $\sum_{k=1}^{100} (4k - 8)$.

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- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{x}{x^2 - 2x}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}\right)^{50}$ in the form $a + bi$.
- [7] 5. (a) Compute the 6 sixth-roots of $\frac{\sqrt{3}}{2} - \frac{i}{2}$.
- [7] (b) Find a real polynomial of least degree having i , -2 and $3 - i$ as roots.
- [8] 6. (a) Express the number $2.123123123\dots$ in the form $\frac{a}{b}$, where a, b are integers and $b \neq 0$.
- [8] (b) Find and simplify the coefficient of $a^{12}b^9$ in the expression $(a + b)^{21}$.
- [7] 7. (a) A hand of 5 cards is chosen randomly from a bridge deck of 52 cards. What is the probability the cards contain no kings and no queens?
- [7] (b) A committee is made up of 6 men and 6 women. What is the probability that a randomly chosen 4-member subcommittee will contain only women?

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| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | December 2008 | 2 |
| Instructors | Course Examiner | |
| R. Mearns, B. Rhodes, J. Ruddy | E. Cohen | |

Special Instructions:

- ▷ Only approved calculators are allowed.
- ▷ Justify and explain all your answers.

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^4 - 4x^3 - 6x^2 + 7x + 24$ is divided by $g(x) = x + \frac{1}{2}$.
- [7] (b) Find an upper integral bound and a lower integral bound for the real zeros of the polynomial $3x^3 + 2x^2 - 21x - 7$, using the Theorem on Bounds.
- [7] 2. (a) Apply Descartes' Rule of Signs to discuss the zeros of $5x^4 - x^3 - 2x^2 + x - 1$
- [7] (b) Show by Mathematical Induction that
$$\frac{1}{2} + \frac{2}{2^2} + \frac{3}{2^3} + \cdots + \frac{n}{2^n} = 2 - \frac{n+2}{2^n}$$
- [7] 3. (a) Write the series $10 + 5 + \frac{5}{2} + \frac{5}{4} + \frac{5}{8} + \frac{5}{16} + \frac{5}{32}$ using the summation notation (\sum).
- [7] (b) Find the sum of the arithmetic series $\sum_{k=1}^{300} (6 - 2k)$.

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- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{-x}{x-1}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^{100}$ in the form $a + bi$.
- [7] 5. (a) Compute the five 5th-roots of $-\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$.
- [7] (b) Find a real polynomial of least degree having $-2i$, $3 + i$ as roots.
- [8] 6. (a) Express the number $4.162162\dots$ in the form $\frac{a}{b}$, where a, b are integers and $b \neq 0$.
- [8] (b) Find and simplify the coefficient of $a^{16}b^9$ in the expression $(a + b)^{25}$.
- [7] 7. (a) How many hands of 13 cards containing 4 spades, 3 hearts, 3 diamonds and 3 clubs can be dealt from a 52-card bridge deck?
- [7] (b) A drawer contains 7 good light bulbs and 3 defective light bulbs. In how many ways can 4 bulbs be chosen so that at least 2 are good?

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CONCORDIA UNIVERSITY
Department of Mathematics

TEXTBOOK MATH 202 (Apr 07)
College Algebra and Trigonometry, 2nd ed.
by J.R. Durbin

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|----------------------|-----------------|------------|
| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | April 2007 | 2 |
| Instructors | Course Examiner | |
| R. Mearns, B. Rhodes | E. Cohen | |

Special Instructions:

- ▷ Non-programmable calculators are allowed.
- ▷ Justify and explain all answers.

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = 3x^5 - 7x^4 + 6x^3 - 3x^2 + 8x + 6$ is divided by $g(x) = x + 2$.
- [7] (b) Find an upper integral bound and a lower integral bound for the real zeros of the polynomial $h(x) = x^3 + 5x^2 - 6x - 30$, using the Theorem on Bounds.

[7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $x^3 - 2x - 1$.

[7] (b) Show by Mathematical Induction that

$$\left(1 + \frac{1}{1}\right) \left(1 + \frac{1}{2}\right) \dots \left(1 + \frac{1}{n}\right) = n + 1$$

[7] 3. (a) Write the sum $\sum_{j=2}^7 \frac{8j+6}{-2j+1}$ without using the summation sign.

(Write all the terms, do not compute their sum.)

[7] (b) (i) Write the series $-9 + 3 - 1 + \frac{1}{3} - \frac{1}{9} + \frac{1}{27} - \frac{1}{81}$ using the summation notation (Σ).

(ii) Find the sum of the arithmetic series $\sum_{j=1}^{1000} (2j + 3)$.

- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{-x}{x^2 - 4}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(-\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^{100}$ in the form $a + bi$.
- [7] 5. (a) Compute the 6 sixth-roots of $-\frac{\sqrt{2}}{2} + \frac{i\sqrt{2}}{2}$. Leave your answer in polar form.
- [7] (b) Find a real polynomial of least degree having $2i$ and $1 - 3i$ as roots.
- [8] 6. (a) Express the number $1.273273\dots$ in the form $\frac{a}{b}$, where a, b are integers and $b \neq 0$. ($1.273273\dots$ is denoted by $1.\dot{2}7\dot{3}$)
- [8] (b) Find the coefficient of $x^{20}y^{25}$ in the expression $(x + y)^{45}$. Explain your answer. Do not simplify.
- [7] 7. (a) How many hands of 13 cards containing 5 spades, 4 hearts, 3 diamonds and 1 club can be dealt from a 52-card bridge deck? Do not simplify.
- [7] (b) A drawer contains 7 good light bulbs and 3 defective light bulbs. In how many ways can 4 bulbs be chosen under the following conditions:
- (i) none is defective.
 - (ii) 2 are good and 2 are defective.
 - (iii) at least 2 are good.
- Explain. Do not simplify.

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| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | December 2007 | 2 |
| Instructors | Course Examiner | |
| C. Cummins, R. Mearns, J. Ruddy, | E. Cohen | |

Special Instructions:

- ▷ Only approved calculators are allowed.
- ▷ Justify and explain all your answers.

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^4 - 3x^3 + 2x^2 - 4x + 7$ is divided by $g(x) = x - 1$.
- [7] (b) Find an upper integral bound and a lower integral bound for the real zeros of the polynomial $2x^3 - 5x^2 - 10x + 25$, using the Theorem on Bounds.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $g(x) = x^3 - 2x - 1$.
- [7] (b) Show by Mathematical Induction that
- $$\frac{1}{2} + \frac{2}{2^2} + \frac{3}{2^3} \dots \frac{n}{2^n} = 2 - \frac{n+2}{2^n}$$
- [7] 3. (a) Write the series $\frac{1}{3} - 1 + 3 - 9 + 27 - 81$ using the summation notation (\sum).
- [7] (b) Find the sum of the arithmetic series $\sum_{j=1}^{400} (2 - 3j)$.

- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{x}{x-2}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^{100}$ in the form $a + bi$.
- [7] 5. (a) Compute the 5 fifth-roots of $-\frac{\sqrt{2}}{2} + \frac{i\sqrt{2}}{2}$.
(Leave the answers in trigonometric form).
- [7] (b) Find a real polynomial of least degree having $2 - i$ and $1 + i$ as zeros.
- [8] 6. (a) Express the number $4.517517\dots$ in the form $\frac{a}{b}$, where a, b are integers and $b \neq 0$.
- [8] (b) In the expansion of $(a + b)^{20}$ write the first 3 terms and the term containing $a^{16}b^4$. Simplify all coefficients.
- [7] 7. (a) A hand of 5 cards is chosen randomly from a bridge deck of 52 cards. What is the probability the cards are all diamonds?
(Leave the answers in factorial form).
- [7] (b) A 3-member subcommittee is chosen from a 10-member committee of 5 males and 5 females. What is the probability the committee contains at least 1 male?

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| Course | Number | Section(s) | 70 |
|----------------------|----------------|-----------------|----|
| Mathematics | 202 | All | |
| Examination | Date | Pages | |
| Final | April/May 2006 | 2 | |
| Instructors | | Course Examiner | |
| B. Rhodes, U. Tiwari | | E. Cohen | |

Materials allowed: Calculator

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = 2x^4 - 6x^3 + 5x^2 - 7x + 2$ is divided by $g(x) = x - 2$.
- [7] (b) Use the Theorem on Bounds to find an upper integral bound for the real zeros of $x^3 + 5x^2 - 6x - 30$. Also find a lower integral bound for the real zeros of that polynomial.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $3x^4 - 5x^3 + x^2 - 5x - 2$.
- [7] (b) Show by mathematical induction that $1 + 4 + 7 + 10 + \dots + (3n - 2) = \frac{n}{2}(3n - 1)$.
- [7] 3. (a) Write the sum $\sum_{k=2}^6 \frac{7k - 3}{2k}$ without using the summation notation.
(Write all the terms, do not compute their sum.)
- [7] (b) (i) Write the series $29 + 21 + 13 + 5 + (-3) + (-11) + (-19)$ using the summation notation (Σ).
- (ii) Find the sum of the arithmetic series $\sum_{j=1}^{50} (3j + 7)$.

- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{2x^2}{x^2 - 1}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(\frac{1}{2} - i\frac{\sqrt{3}}{2}\right)^{15}$ in the form $a + bi$.
- [7] 5. (a) Compute the 5 5th-roots of $\frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$.
- [7] (b) Find a real polynomial of least degree having $2 - 3i$ and 7 as roots.
- [8] 6. (a) Express the number $2.237237237\dots$ in the form $\frac{a}{b}$ where a, b are integers, $b \neq 0$. ($2.237237237\dots$ is denoted by $2.\dot{2}3\dot{7}$)
- [8] (b) Find and simplify the coefficient of $x^{12}y^6$ in the expression $(x + y)^{18}$. Explain your answer.
- [7] 7. (a) In how many ways can 4 girls and 4 boys walk through a doorway single file if
- (i) There are no restrictions?
 - (ii) The girls walk through before the boys?
- Justify your answer.
- [7] (b) A shipment of 10 microwave ovens contains 3 defective units. In how many ways can one buy 4 of these ovens and receive
- (i) All good ovens?
 - (ii) 2 good ovens?
 - (iii) At least 2 good ovens?
- Explain.

Department of Mathematics & Stat

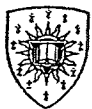
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|--------------------------------|-----------------|------------|
| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | December 2005 | 2 |
| Instructors | Course Examiner | |
| R. Mearns, B. Rhodes, J. Ruddy | E. Cohen | |

Materials allowed: Calculator

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^4 - 7x^3 + 8x^2 - 6x + 14$ is divided by $g(x) = x + 3$.
- [7] (b) Use the Theorem on Bounds to find an upper integral bound for the real zeros of $2x^3 - 5x^2 + 2x - 5$. Also find a lower integral bound for the real zeros of that polynomial.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $3x^5 - 5x^4 + 3x^3 - 7x^2 + 2x - 4$.
- [7] (b) Show by mathematical induction that $n < 2^n$ for all $n \in \mathbb{N}$.
- [7] 3. (a) Write the sum $\sum_{i=3}^7 \frac{3-2i}{i-2}$ without using the summation notation.
(Write all the terms, do not compute their sum.)
- [7] (b) (i) Write the series $25 + 22 + 19 + 16 + 13 + \cdots + 4$ using the summation notation (\sum).
- (ii) Find the sum of the arithmetic series $\sum_{j=1}^{100} (2 - 3j)$.

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Department of Mathematics & Statistics

TEXTBOOK - MATH 202 (Apr 05)

College Algebra and Trigonometry, 2nd ed.
by J.R. Durbin

| | | |
|---------------------|------------|-----------------|
| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | April 2005 | 2 |
| Instructors | | Course Examiner |
| E. Cohen, B. Rhodes | | E. Cohen |

Materials allowed: Calculator

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^5 - 7x^4 + 8x^3 + 9x^2 - 5$ is divided by $g(x) = x + 1$.
- [7] (b) Use the Theorem on Bounds to find the upper and lower integral bounds for the real zeros of $3x^3 - 2x^2 + 3x - 2$.

- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $5x^4 - x^3 - 2x^2 + x - 1$

- [7] (b) Show by mathematical induction that

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$$

- [7] 3. (a) Write the sum $\sum_{j=2}^6 \frac{2j-5}{j-1}$ without using the summation notation.

(Write all the terms, do not compute their sum.)

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- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{2x}{x^2 - x - 2}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(\frac{\sqrt{2}}{2} - \frac{i\sqrt{2}}{2}\right)^{13}$ in the form $a + bi$.
- [7] 5. (a) Compute the 4 complex 4th-roots of $\frac{\sqrt{3}}{2} + \frac{i}{2}$.
- [7] (b) Find a real polynomial of least degree having $3 - i$ and $2i$ as roots.
- [8] 6. (a) Express the number $3.175175175\dots$ in the form $\frac{a}{b}$ where a, b are integers, $b \neq 0$. ($3.175175175\dots$ is denoted by $3.\dot{1}7\dot{5}$)
- [8] (b) Find and simplify the coefficient of x^6y^{20} in the expression $(x+y)^{26}$. Explain your answer.
- [7] 7. (a) How many 4-digit numbers can be formed with the digits 1, 2, 3, 6, 8, 9 if digits cannot be repeated? Justify your answer.
- [7] (b) How many hands of 5 cards containing no aces and no jacks can be dealt from a 52-card bridge deck? Explain.

- [7] 3. (b) (i) Represent the series $3 + 5 + 7 + \cdots + 29$ using the summation notation (\sum).
- (ii) Find the sum of the arithmetic series $\sum_{j=1}^{50} (2j - 3)$.
- [7] 4. (a) Find all the horizontal and vertical asymptotes of $f(x) = \frac{3}{4-x}$ and sketch the graph.
- [7] (b) Use De Moivre's theorem to express $\left(-\frac{1}{2} - \frac{i\sqrt{3}}{2}\right)^{24}$ in the form $a + bi$.
- [7] 5. (a) Compute the complex 6th-roots of $-\sqrt{3} + i$.
- [7] (b) Find a real polynomial of least degree having $2 + i$ and 5 as zeros.
- [8] 6. (a) Express the number $2.147147147\dots$ in the form $\frac{a}{b}$ where a, b are integers, $b \neq 0$. ($2.147147147\dots$ is denoted by $2.\dot{1}4\dot{7}$)
- [8] (b) Find and simplify the coefficient of $x^{14}y^5$ in the expression $(x + y)^{19}$.
- [7] 7. (a) How many 3-digit numbers can be formed with the digits 2, 5, 6, 7, 8, 9 if digits cannot be repeated?
- [7] (b) How many hands of 4 cards containing no kings and no queens can be dealt from a 52-card bridge deck?

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Department of Mathematics & Statistics

TEXTBOOK - MATH 202 (Dec 04)

College Algebra and Trigonometry, 2nd ed.
by J.R. Durbin

| Course | Number | Section(s) |
|------------------------------|-----------------|------------|
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | December 2004 | 2 |
| Instructors | Course Examiner | |
| L. Dube, R. Mearns, J. Ruddy | E. Cohen | |

Materials allowed: Calculator

MARKS

[7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^5 - x^4 + 3x^3 - 2x + 3$ is divided by $g(x) = x - 1$.

[7] (b) Use the Theorem on Bounds to give the upper and the lower integral bounds for the real zeros of $3x^3 + x^2 - 21x + 7$.

[7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $-x^5 + 3x^4 + 7x^3 - 2x - 1$.

[7] (b) Show by mathematical induction that

$$(1^2 + 2^2 + 3^2 + \dots + n^2) = \frac{n(n+1)(2n+1)}{6}$$

[7] 3. (a) Write the sum $\sum_{j=3}^8 \frac{(j-2)}{j^2}$ without using the summation notation.

(Write all the terms, do not compute their sum).

[7] 3. (b) (i) Represent the series $23 + 19 + 15 + 11 + 7 + 3$ using the summation notation (\sum).

(ii) Find the sum of the arithmetic series $\sum_{j=1}^{30} (2 - 5i)$.

[7] 4. (a) Find all the horizontal and vertical asymptotes of $f(x) = \frac{2}{x-1}$ and sketch the graph.

[7] (b) Use De Moivre's theorem to express $\left(\frac{\sqrt{2}}{2} - i\frac{\sqrt{2}}{2}\right)^{26}$ in the form $a + bi$.

[7] 5. (a) Compute the complex 4th-roots of $1 + i$.

[7] (b) Find a real polynomial of least degree having $1 - i$ and $2 - i$ as zeros.

[8] 6. (a) Express the number $6.236236236\dots$ in the form $\frac{a}{b}$ where a, b are integers, $b \neq 0$. ($6.236236236\dots$ is denoted by $6.\overline{236}$)

[8] (b) Find and simplify the coefficient of x^5y^{17} in the expression $(x + y)^{22}$.

[7] 7. (a) How many 2-digit numbers can be formed with the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 if digits cannot be repeated?

[7] (b) How many hands of 5 cards containing no queens and no aces can be dealt from a 52-card bridge deck?

#554
16



Concordia
UNIVERSITY

Department of Mathematics & Statistics

TEXTBOOK: MATH 202 (APR 04)
College Algebra and Trigonometry, 2nd ed
by J.R. Durbin

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|-------------------------------|-----------------|------------|
| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | April 2004 | 2 |
| Instructors | Course Examiner | |
| A. Kokotov, J. Ruddy | E. Cohen | |
| Materials allowed: Calculator | | |

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = -x^4 + 3x^3 - 2x^2 + 7x + 2$ is divided by $g(x) = x - 3$.
- [7] (b) Use the Theorem on Bounds to give the upper and the lower integral bounds for the real zeros of $x^3 + 5x^2 - 6x - 30$.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $3x^4 - 5x^3 + x^2 - 5x - 2$.
- [7] (b) Show by mathematical induction that $(1 \cdot 2) + (2 \cdot 3) + (3 \cdot 4) + \dots + n(n+1) = \frac{n(n+1)(n+2)}{3}$.
- [7] 3. (a) Write the sum $\sum_{j=3}^8 \frac{(j-2)}{-j^2}$ without using the summation notation.
(Write all the terms, do not compute their sum).

- [7] 3. (b) (i) Represent the series $1 + 1.05 + 1.10 + \dots + 1.95$ using the summation notation (\sum).
- (ii) Find the sum of the arithmetic series $\sum_{k=1}^{100} (2k + 3)$.
- [7] 4. (a) Find all the horizontal and vertical asymptotes of $f(x) = \frac{2}{x-3}$ and sketch the graph.
- [7] (b) Use De Moivre's theorem to express $\left(\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i\right)^{15}$ in the form $a + bi$.
- [7] 5. (a) Compute the complex 4th-roots of $1 + i$.
- [7] (b) Find a real polynomial of least degree having $1 + i$ and i as zeros.
- [8] 6. (a) Express the number $5.\dot{3}\dot{4}\dot{6}$ in the form $\frac{a}{b}$ where a, b are integers, $b \neq 0$.
($5.\dot{3}\dot{4}\dot{6}$ denotes $5.346346346\dots$)
- [8] (b) Find and simplify the coefficient of x^6y^{10} in the expression $(x + y)^{16}$.
- [7] 7. (a) How many odd 2-digit numbers can be formed with the digits 1, 2, 3, 4, 5, 6 if digits cannot be repeated?
- [7] (b) How many hands of 5 cards containing no kings and no queens can be dealt from a 52-card bridge deck?

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TEXTBOOK - MATH 202 (DEC 03)

♦ *College Algebra and Trigonometry*, 2nd ed.
by J.R. Durbin



Concordia
UNIVERSITY

Department of Mathematics & Statistics

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|---------------------|------------------------|-------------------|
| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | December 2003 | 2 |
| Instructors | Course Examiner | |
| B. Rhodes. J. Ruddy | E. Cohen | |

Materials allowed: Calculator

MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^4 - 2x^3 + 3x^2 - 2x + 1$ is divided by $g(x) = x - 2$.
- [7] (b) Use the Theorem on Bounds to find the upper and lower integral bounds for the real zeros of $2x^3 - 5x^2 - 10x + 25$.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $5x^4 - x^3 - 2x^2 + x - 1$.
- [7] (b) Show by mathematical induction that $1 + 3 + 5 + \dots + (2n - 1) = n^2$.
- [7] 3. (a) Write the sum $\sum_{k=2}^7 \frac{(3-k)}{k^2}$ without using the summation notation (write all the terms. do not compute their sum).

- [7] 3. (b) (i) Represent the series $1 - 5 - 11 - 17 - \dots - 71$ using summation (\sum) notation.
- (ii) Find the sum of the arithmetic series $\sum_{i=1}^{40} (7 - 6i)$.
- [7] 4. (a) Find all the horizontal and vertical asymptotes of $f(x) = \frac{4}{2-x}$ and sketch the graph.
- [7] (b) Use De Moivre's theorem to express $(\frac{1}{2} + \frac{\sqrt{3}}{2}i)^{20}$ in the form $a + bi$.
- [7] 5. (a) Compute the complex 5th-roots of $2 - i$.
- [7] (b) Find a real polynomial of least degree having $-1 + i$ and 2 as zeros.
- [8] 6. (a) Express the number $12.\dot{1}3\dot{7}$ in the form $\frac{a}{b}$ where a, b are integers. $b \neq 0$.
($12.\dot{1}3\dot{7}$ denotes $12.137137137\dots$)
- [8] (b) Find and simplify the coefficient of $x^{13}y^8$ in the expression $(x + y)^{21}$.
- [7] 7. (a) How many even 3-digit numbers can be formed with the digits 1, 2, 3, 4, 5, 6, 7 if digits can be repeated?
- [7] (b) How many hands of 4 cards containing no kings can be dealt from a 52-card bridge deck?



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| Course | Number | Section(s) |
| Mathematics | 202 | All |
| Examination | Date | Pages |
| Final | April/May 2003 | 2 |
| Instructors | | Course Examiner |
| M. Bertola, J. Rasmussen | | E. Cohen |

Materials allowed: Calculator

MARKS

[7] 1. (a) Use synthetic division to find the quotient and the remainder when $f(x) = x^4 - 2x^3 + 7x^2 - 5x + 3$ is divided by $g(x) = x + 3$.

[7] (b) Use the Theorem on Bounds to find the upper and lower integral bounds for the real zeros of $3x^3 + x^2 - 21x + 7$.

[7] 2. (a) Apply the Descartes Rule of Signs to discuss the zeros of $3x^4 - 5x^3 + x^2 - 5x - 2$.

[7] (b) Show by mathematical induction that $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$.

[7] 3. (a) Write the sum $\sum_{i=1}^7 (2i^2 - 1)$ without using the summation notation (write all the terms; do not compute their sum).

[7] 3. (b) (i) Represent the series $-9 + 11 - 13 + 15 - 17 + 19 - 21 + 23$ using summation (\sum) notation.

(ii) Find the sum of the arithmetic series $\sum_{j=1}^{40} (2 - 3j)$.

[7] 4. (a) Find all the horizontal and vertical asymptotes of $f(x) = \frac{3}{x+1}$ and sketch the graph.

[7] (b) Use De Moivre's theorem to express $(\frac{1}{2} + \frac{\sqrt{3}}{2}i)^5$ in the form $a + bi$.

[7] 5. (a) Compute the five fifth complex roots of $1 - i$.

[7] (b) Find a real polynomial of least degree having $1 + i$ and $1 - 2i$ as zeros.

[8] 6. (a) Express the number $12.\dot{2}5$ in the form $\frac{a}{b}$ where a, b are integers, $b \neq 0$.
($12.\dot{2}5$ denotes $12.25252525\dots$)

[8] (b) Find and simplify the coefficient of $x^{12}y^8$ in the expression $(x + y)^{20}$.

[7] 7. (a) How many even 3-digit numbers can be formed with the digits 1, 2, 3, 4, 5, 6, 7 if digits can be repeated?

[7] (b) How many hands of 5 cards containing no kings and no queens can be dealt from a 52-card bridge deck?

CONCORDIA UNIVERSITY
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|--|-----------------|------------|
| Mathematics | 202 | All |
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| Final | December 2006 | 2 |
| Instructors | Course Examiner | |
| B. Rhodes, J. Ruddy, D. Sevilla-Gonzalez | E. Cohen | |

Special Instructions:

- ▷ Calculators are permitted.
- ▷ Justify and explain all answers.

TEXTBOOK - MATH 202 (Dec 06)

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MARKS

- [7] 1. (a) Use synthetic division to find the quotient and the remainder when $g(x) = 3x^4 + 8x^3 - 7x^2 + 4x - 8$ is divided by $h(x) = x - 1$.
- [7] (b) Find an upper integral bound and a lower integral bound for the real zeros of the polynomial $2x^3 - 5x^2 - 10x + 25$, using the Theorem on Bounds.
- [7] 2. (a) Apply the Descartes' Rule of Signs to discuss the zeros of $-x^5 + 3x^4 + 7x^3 - 2x - 1$.
- [7] (b) Show by Mathematical Induction that
$$\frac{1}{1 \cdot 2 \cdot 3} + \frac{1}{2 \cdot 3 \cdot 4} + \frac{1}{3 \cdot 4 \cdot 5} + \cdots + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}.$$
- [7] 3. (a) Write the sum $\sum_{k=1}^5 \frac{2-8k}{k+1}$ without using the summation notation.
(Write all the terms, do not compute their sum.)
- [7] (b) (i) Write the series $4 + 2 + 1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8}$ using the summation notation (Σ).
- (ii) Find the sum of the arithmetic series $\sum_{j=1}^{100} (3 - 2j)$.

- [7] 4. (a) Find all horizontal and vertical asymptotes of $f(x) = \frac{-x}{(x+1)(x-3)}$ and sketch its graph.
- [7] (b) Use De Moivre's theorem to express $\left(\frac{\sqrt{2}}{2} - \frac{i\sqrt{2}}{2}\right)^{20}$ in the form $a + bi$.
- [7] 5. (a) Compute the seven 7th-roots of $\frac{1}{2} - i\frac{\sqrt{3}}{2}$.
- [7] (b) Find a real polynomial of least degree having $-3i$ and 8 as roots.
- [8] 6. (a) Express the number $21.345345345\dots$ in the form $\frac{a}{b}$, where a, b are integers and $b \neq 0$. ($21.345345345\dots$ is denoted by $21.\dot{3}4\dot{5}$)
- [8] (b) Find and simplify the coefficient of x^7y^{15} in the expression $(x+y)^{22}$. Explain your answer.
- [7] 7. (a) Three routes connect points A and B .
- (i) In how many ways can one go from A to B and then back to A ?
- (ii) In how many ways can one go from A to B and back to A if the route from B to A is different from the route from A to B ?
- Justify your answer.
- [7] (b) Twenty computers are in an office and five of them are defective. In how many ways can one choose seven of them and obtain
- (i) 6 good computers?
- (ii) at least 3 good computers?
- (iii) only good computers?
- Explain.