MATHEMATICAL METHODS (CAS)

Written examination 2

Thursday 5 November 2015
Reading time: 3.00 pm to 3.15 pm (15 minutes)
Writing time: 3.15 pm to 5.15 pm (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

<table>
<thead>
<tr>
<th>Section</th>
<th>Number of questions</th>
<th>Number of questions to be answered</th>
<th>Number of marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 80</td>
</tr>
</tbody>
</table>

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, a protractor, set squares, aids for curve sketching, one bound reference, one approved CAS calculator (memory DOES NOT need to be cleared) and, if desired, one scientific calculator. For approved computer-based CAS, their full functionality may be used.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

Materials supplied
- Question and answer book of 26 pages with a detachable sheet of miscellaneous formulas in the centrefold.
- Answer sheet for multiple-choice questions.

Instructions
- Detach the formula sheet from the centre of this book during reading time.
- Write your student number in the space provided above on this page.
- Check that your name and student number as printed on your answer sheet for multiple-choice questions are correct, and sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.
SECTION 1

**Instructions for Section 1**

Answer all questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is correct for the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will not be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

SECTION 2

**Instructions for Section 2**

Answer all questions in the spaces provided.
In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.
In questions where more than one mark is available, appropriate working must be shown.
Unless otherwise indicated, the diagrams in this book are not drawn to scale.
MATHEMATICAL METHODS (CAS)

Written examinations 1 and 2

FORMULA SHEET

Instructions

Detach this formula sheet during reading time.
This formula sheet is provided for your reference.
Mathematical Methods (CAS)

Formulas

Mensuration

area of a trapezium: \( \frac{1}{2}(a+b)h \)

volume of a pyramid: \( \frac{1}{3}Ah \)
curved surface area of a cylinder: \( 2\pi rh \)
volume of a cylinder: \( \pi r^2h \)
area of a triangle: \( \frac{1}{2}bc\sin A \)

Calculus

\[
\frac{d}{dx}(x^n) = nx^{n-1} \\
\frac{d}{dx}(e^{ax}) = ae^{ax} \\
\frac{d}{dx}(\log_e(x)) = \frac{1}{x} \\
\frac{d}{dx}(\sin(ax)) = a\cos(ax) \\
\frac{d}{dx}(\cos(ax)) = -a\sin(ax) \\
\frac{d}{dx}(\tan(ax)) = \frac{a}{\cos^2(ax)} = a\sec^2(ax) \\
\]

product rule: \( \frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \)

quotient rule: \( \frac{d}{dx}\left( \frac{u}{v} \right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \)

chain rule: \( \frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} \)

approximation: \( f(x + h) \approx f(x) + hf'(x) \)

Probability

\[
\Pr(A) = 1 - \Pr(A') \quad \text{Pr}(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B) \]

\[
\Pr(A|B) = \frac{\Pr(A \cap B)}{\Pr(B)} \quad \text{transition matrices: } S_n = T^n \times S_0 \\
\]

mean: \( \mu = \mathbb{E}(X) \)

variance: \( \text{var}(X) = \sigma^2 = \mathbb{E}((X - \mu)^2) = \mathbb{E}(X^2) - \mu^2 \)

<table>
<thead>
<tr>
<th>Probability distribution</th>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>discrete ( \Pr(X = x) = p(x) )</td>
<td>( \mu = \sum x p(x) )</td>
<td>( \sigma^2 = \sum (x - \mu)^2 p(x) )</td>
</tr>
<tr>
<td>continuous ( \Pr(a &lt; X &lt; b) = \int_a^b f(x)dx )</td>
<td>( \mu = \int_{-\infty}^{\infty} x f(x)dx )</td>
<td>( \sigma^2 = \int_{-\infty}^{\infty} (x - \mu)^2 f(x)dx )</td>
</tr>
</tbody>
</table>
STUDENT NAME: JOHN STUDENT

INSTRUCTIONS:

SIGN HERE IF YOUR NAME AND NUMBER ARE PRINTED CORRECTLY.

SIGNATURE: ________________________________

If your name or number on this sheet is incorrect, notify the Supervisor.

Use a PENCIL for ALL entries. For each question, shade the box which indicates your answer.

All answers must be completed like THIS example: 

Marks will NOT be deducted for incorrect answers.

NO MARK will be given if more than ONE answer is completed for any question.

If you make a mistake, ERASE the incorrect answer – DO NOT cross it out.

Shade the “ABSENT” box if the student was absent from the examination.

SUPERVISOR

OFFICE USE ONLY

Please DO NOT fold, bend or staple this form.