### MATHEMATICS METHODS

## 8 LOS noisenimex3 (4 bns & stinU) S 19189m98 AWAM

**Calculator-free** 

Marking Key

0 MAWA, 2016

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The release date for this exam and marking scheme is

• the end of week 1 of term 4, 2016

# CALCULATOR-FREE MARKING KEY

#### MATHEMATICS METHODS SEMESTER 2 (UNITS 3 AND 4) EXAMINATION

#### Section One: Calculator-free

(54 Marks)

Question 1(a)

Solution	
$ \ln m = \frac{3}{2} \Rightarrow m = e^{\frac{3}{2}} $	
Marking key/mathematical behaviours	
identifies correct base	1
determines correct power	1

#### Question 1(b)

Solution

$$\log[(m+3)m] = 1$$

$$(m+3)m=10^1$$

$$m^2 + 3m - 10 = 0$$

$$(m+5)(m-2)=0$$

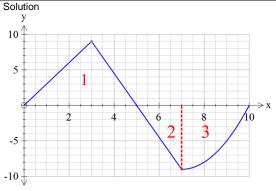
m = -5 or 2 but since m has to be greater than zero, m = 2 is the only solution

m = -3 or 2 but since m has to be greater than zero, $m = 2$ is the only solution	IOH.
Marking key/mathematical behaviours	Marks
applies logarithmic rule for a product correctly	1
recognises base 10	1
creates equation with correct trinomial	1
<ul> <li>solves equation correctly giving the correct value of m</li> </ul>	1

Question 2(a)(i)

Question 2(a) (i)	
Solution	
$\frac{dy}{dx} = \frac{(6x^4 - x^3 + e)(4e^x) - (4e^x)(24x^3 - 3x^2)}{(4e^x)^2 + (4e^x)(24x^3 - 3x^2)}$	
$\frac{dx}{dx} = \frac{\left(6x^4 - x^3 + e\right)^2}{\left(6x^4 - x^3 + e\right)^2}$	
Marking key/mathematical behaviours	
<ul> <li>differentiates the 1st term on numerator correctly</li> </ul>	1
<ul> <li>differentiates the 2nd term on numerator correctly</li> </ul>	1
<ul> <li>squares factor on denominator</li> </ul>	1

#### Question 10(b)



Area 
$$2 = \frac{1}{2} \times 2 \times 9$$
  
= 9 square units

ea 
$$3 = 50 - 22\frac{1}{2} - 9$$
  
=  $18\frac{1}{2}$  square unit

$$\int_{7}^{6} f(x)dx = -\text{Area } 3$$
$$= -18\frac{1}{2}$$

Marking key/mathematical behaviours	Marks	
calculates area 2	1	
calculates area 3	1	
determines integral	1	

# METHEMETICS METHODS SEMESTER 2 (UNITS 3 AND 4) EXAMINATION

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#### Question 10(a)

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Solution

Page 10

determines integral.

Marking key/mathematical behaviours

Area of triangle (Area I)  $\int_{0}^{\xi} \int_{0}^{\xi} \int_{0}^{\xi$ 

identifies integral as area of correct triangle

# notituos $[(x)\text{nis})\text{ni} - (\xi + {}^{\varepsilon}x\xi)\text{ni}]\frac{b}{xb} = \frac{\sqrt{b}}{xb}$ $[(x)\text{nis})\text{ni} - (\xi + {}^{\varepsilon}x\xi)\text{ni}]\frac{b}{xb} = \frac{\sqrt{b}}{xb}$ $\frac{(x)\text{nis}}{(\xi + {}^{\varepsilon}x\xi)} - \frac{(\xi + {}^{\varepsilon}x\xi)}{(\xi + {}^{\varepsilon}x\xi)} = \frac{(x)\text{ni}}{xb}$

Question 2(a)(ii)

Marks	g key/mathematical behaviours	Markin
l	applies correctly logarithmic rule for quotients	•
l	differentiates correctly 1st term	•
l	differentiates correctly 2nd term	•

#### Question 2(b)

#### Solution

Marks

**MARKING KEY** 

CALCULATOR-FREE

$$((x)\operatorname{nis} + xz) \frac{1}{z} = \frac{np}{\sqrt{p}} \qquad \text{bns} \qquad (x)\operatorname{nis} + xz = \frac{xp}{np} \Longleftrightarrow (x)\operatorname{nis} + xz = \frac{xp}{\sqrt{p}} \Longleftrightarrow (x)\operatorname{nis} + xz = x\operatorname{nis} +$$

r	elem ede de mi mate e <b>à de la constant de la consta</b>
Marks	Marking key/mathematical behaviours

- differentiates correctly to determine? Ist factor in chain rule
   differentiates correctly to determine 2nd factor in chain rule
- x to simple in terms of x

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#### MATHEMATICS METHODS SEMESTER 2 (UNITS 3 AND 4) EXAMINATION

# CALCULATOR-FREE MARKING KEY

Question 3(a)

Solution	
Discrete random variable	
Marking key/mathematical behaviours	Marks
determines correct category	1

Question 3(b)

4.00.0.0.0	
Solution	
Non-random variable	
Marking key/mathematical behaviours	Marks
determines correct category	1

Question 3(c)

Solution	
Continuous random variable	
Marking key/mathematical behaviours	Marks
determines correct category	1

#### MATHEMATICS METHODS SEMESTER 2 (UNITS 3 AND 4) EXAMINATION

CALCULATOR-FREE MARKING KEY

#### Question 9(c)(i)

Solution

$n_2$ is larger than $n_1$	
To increase confidence a larger interval is required for a stable sample size. Increasing	g n reduces
the standard error and thus the interval can remain the same.	
Marking key/mathematical behaviours	Marks
<ul> <li>states n<sub>2</sub> is larger with reason</li> </ul>	1

#### Question 9(c)(ii)

· states correct reason

Solution

$$E_1 = 1 \times \sqrt{\frac{m(1-m)}{n_1}}$$

$$E_2 = 1.5 \times \sqrt{\frac{m(1-m)}{n_2}}$$

Same interval so  $E_1 = E_2$ 

$$\sqrt{\frac{m(1-m)}{n_1}} = 1.5 \times \sqrt{\frac{m(1-m)}{n_2}}$$

$$\frac{m(1-m)}{n_1} = (1.5)^2 \frac{m(1-m)}{n_2}$$

$$\frac{n_2}{n_1} = 2.25$$

$$n_2 = 2.25n_1$$

Marking key/mathematical behaviours	Marks
equates E <sub>1</sub> and E <sub>2</sub>	1
squares both sides	1
states relationship	1

#### Question 9(a)(ii)

l	states interval	•
L	3 səifilqmiz	•
l	simplifies square root	•
l	substitutes values for z, n and p	•
Marks	ng key/mathematical behaviours	Markir
	5% CI is (0.12, 0.28)	\$6
	80.0	) =
	$\frac{0s}{7} \times 7$	ζ =
	$\frac{0087}{t}$ $\sqrt{\times}$	ζ =
	$\frac{(\frac{1}{\zeta}-1)\frac{1}{\zeta}}{\sqrt{100}} \sqrt{100}$	$E = \mathcal{I}$
	uo	Solutio
	(u/u)c uo	

#### Question 9(b)

<b>▶</b>	levaetai egaebitago seteta
l	∃ senimines E
Marks	Marking key/mathematical behaviours
	$(\overline{\frac{(m-1)m}{n}}) + m, \overline{\frac{(m-1)m}{n}}) - m $ si IS %89
	$\frac{(m-1)m}{r^n} \times 1 = \mathcal{A}$
	Solution

	9 100 100 100 100 100 100 100 100 100 10		1
l	E serimines E	•	
l	states confidence interval.	•	

## 4 noitsau 4

alculates the value of $k$	eo e
valuates integral correctly	√ə •
iegrates correctly	ui •
one of satural and equates to one	es •
ey/mathematical behaviours Marks	Marking k
$I = xb \stackrel{\epsilon}{=} I = \begin{bmatrix} \frac{1}{1} \\ \frac{1}{1} \end{bmatrix}$	$-\frac{z}{1} \bigg] \gamma$ $-\frac{z}{z^{x}} \bigg] \gamma$ $\frac{z}{x} - x \int_{1}^{0} \gamma y$
	Solution

#### Question 5

Marks   Marks   Marks   Marks   Alexander   Marks   Marks   Sets up equation using variance of a Bernoulli distribution   1   factorises trinomial   1   1   1   1   1   1   1   1   1	•
sets up equation using variance of a Bernoulli distribution	
	•
ואומועם ובווומות אבו הבוומאות ובוומאות אבו הבוומאות ובוומאות ובוומאות ובוומאות ובוומאות ובוומאות ובוומאות בוומאות בוומאת בוומאות בוומא בוומא בוומא בוומא בוומא בוומא בוומא בוומאת בוומ	•
Native the matrice of the providence	Marking
$\frac{\varepsilon}{t} = q \text{ or } \frac{1}{t} = q \iff 0 = (\varepsilon - q^{t})(\varepsilon)$	[ − d <sub>V</sub> )
$\frac{2}{91} = \frac{2}{5} \left(\frac{5}{4}\right) = (d-1)d$	
Į.	Solution

#### MATHEMATICS METHODS SEMESTER 2 (UNITS 3 AND 4) EXAMINATION

# CALCULATOR-FREE MARKING KEY

#### MATHEMATICS METHODS SEMESTER 2 (UNITS 3 AND 4) EXAMINATION

· determines indefinite integral

ullet substitutes initial conditions to calculate the constant c

#### Question 6(a)

Solution	
Function is valid for $x \ge -3$	
Marking key/mathematical behaviours Marks	
<ul> <li>correctly states the values of x for which the function is valid</li> </ul>	1

#### Question 6(b)

Question o(b)	
Solution	
$\frac{dy}{dx} = \frac{2}{2x+6} = 4 \Rightarrow \frac{2x+6}{2} = \frac{1}{4} \Rightarrow x+3 = \frac{1}{4} \Rightarrow x = -2.75$	
Marking key/mathematical behaviours Marks	
• differentiates correctly 1	
solves equation correctly	1

#### Question 7(a)

w.	aconon r(a)						
	Solution						
	у	0	1	2	3	4	
	P(Y = y)	0	k	4 <i>k</i>	9k	16k	
١	/larking key/ma	thematical be	haviours				Marks
	<ul> <li>correctly</li> </ul>	y completes to	wo values				1
	<ul> <li>correctly</li> </ul>	y completes 4	values				1

#### Question 7(b)

Solution	
k + 4k + 9k + 16k = 1	
$30k = 1  \Rightarrow \ k = \frac{1}{30}$	
Marking key/mathematical behaviours	Marks
sums probabilities equal to one	1
<ul> <li>correctly solves equation for k</li> </ul>	1

#### **Question 8**

Solution	
$f(x) = \int f'(x)  dx$	
$= \int 2xe^{3x^2-1} dx$	
$= \frac{1}{3}e^{3x^2-1} + c$	
since $f(0) = 0$ :	
$0 = \frac{1}{3}e^{-1} + c$	
$c = -\frac{1}{3e}$	
$f(x) = \frac{1}{3}e^{3x^2 - 1} - \frac{1}{3e}$	
Marking key/mathematical behaviours	Marks

## Question 9 (a)(i)

states f(x)

Solution	
20 1	
$p = \frac{100}{100} = \frac{1}{5}$	
Marking key/mathematical behaviours	Marks
determines the proportion	1