 **NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**UNITS 3 & 4 Practice Examination**

**VCE**®**Mathematical Methods**

**Written examination 2**

**Reading time: 15 minutes Writing time: 2 hours**

**QUESTION AND ANSWER BOOK**

**Structure of book**

|  |  |  |  |
| --- | --- | --- | --- |
| *Section* | *Number of*  *questions* | *Number of questions*  *to be answered* | *Number of*  *marks* |
| A | 20 | 20 |  |
| B | 4 | 4 |  |
|  |  |  |  |

* 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 or CAS software and, if desired, one scientific calculator. Calculator memory DOES NOT need to be cleared.
* Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

**Materials supplied**

* A question and answer book of 27 pages.
* A double-sided page of formulas.
* An answer sheet for multiple-choice questions.

**Instructions**

* Write your name in the space provided above on this page.
* Write your name on the multiple-choice answer sheet.
* Unless otherwise indicated the diagrams in this book are **not** drawn to scale.
* All written responses must be in English.

**At end of 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.**

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**SECTION A – Multiple-choice questions**

**Instructions for Section A**

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.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

**Question 1**

A special die numbered 1, 2, 3, 4, 5 and 5 is thrown. The random variable *P* is the number of 5s in twelve throws of both dice. Pr (*P* ≥ 3)to four decimal places is

|  |  |
| --- | --- |
| **A.** | 0.1811 |
| **B.** | 0.3931 |
| **C.** | 0.6069 |
| **D.** | 0.6775 |
| **E.** | 0.8189 |

**Question 2**

A discrete random variable X has the following probability distribution:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *X* | -1 | 0 | 1 | 2 | 3 |
| Pr(*X = x*) | 2*p* | 0.3 | *p – q* | 2*q* | 0.1 |

What is the largest possible value of the mean of X?

|  |  |
| --- | --- |
| **A.** | 0.1 |
| **B.** | 0.4 |
| **C.** | 0.6 |
| **D.** | 0.9 |
| **E.** | 2.1 |

**Question 3**

A continuous random variable has a probability distribution given by



 elsewhere.

Pr (*X < a*) = 0.875

The value of *a* is

|  |  |
| --- | --- |
| **A.** | 1 |
| **B.** | 2 |
| **C.** |  |
| **D.** | 3 |
| **E.** | 3 |

**Question 4**

The mass of Ezy-Crème donuts is normally distributed with mean 60*g* and variance 25*g.* Given that a donut chosen at random is over 55*g*, what is the probability that the mass is 70*g* or less?

|  |  |
| --- | --- |
| **A.** | 0.9729 |
| **B.** | 0.9772 |
| **C.** | 0.8185 |
| **D.** | 0.1314 |
| **E.** | 0.0761 |

**Question 5**

An eight-sided (octahedral) die has the numbers 1 to 8 on its faces. The die is thrown 12 times. The random variable *P* represents the occurrences of a prime number. (Students should note that 1 is **not** a prime number.) The mean and standard deviation of *P* is

|  |  |
| --- | --- |
| **A.** | μ = 6, σ = 3 |
| **B.** | μ = 6, σ = √3 |
| **C.** | μ = 3, σ = 3 |
| **D.** | μ = 3, σ = √3 |
| **E.** | μ = 4, σ = 3 |

**Question 6**

The sum of all the solutions to is

|  |  |
| --- | --- |
| **A.** | 0 |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 7**

. The area enclosed by and is

|  |  |
| --- | --- |
| **A.** | 6 |
| **B.** | 2.25 |
| **C.** | 3 |
| **D.** | 6 – 3√3 |
| **E.** | 9 – 3√3 |

**Question 8**

A student uses a rectangle approximation to estimate the area under the graph of *f* as shown:

. You may use technology, or else).

The ratio of real area to approximation is

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 9**

The average value of the function  over the domain [0, *a*] is

|  |  |
| --- | --- |
| **A.** | *a* |
| **B.** |  |
| **C.** |  |
| **D.** | *ae* |
| **E.** | *a*(*e –* 1) |

**Question 10**

. The chord connecting (1, *f* (1)) and (2, *f* (2)) has a length of

|  |  |
| --- | --- |
| **A.** | √3*a* |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 11**

The graph of the functionis subject to the following transformations: (a) translation of -*b* units along the *x* axis (b) reflection in the *x* axis (c) dilation by a factor of *a* away from the *x* axis. The resultant function  is given by what rule?

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 12**

The functionis subject to the following transformation *T*:

 The transformed function is

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 13**

The area enclosed by , the *y* axis, and the lines *y* = 1 and *x* = 2 is

*y*

*x*

|  |  |
| --- | --- |
| **A.** |  |
| **B.** | 2 – |
| **C.** |  |
| **D.** | 2 + |
| **E.** |  |

**Question 14**

*y*

*x*

The above graph could represent the function *f*

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 15**

. The inverse function  is

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 16**

Given that , calculate.

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** |  |

**Question 17**

State the period and range of the function .

|  |  |
| --- | --- |
| **A.** | and [-2, 2] |
| **B.** | 2*a* and [1, 5] |
| **C.** | *a* and [-2, 2] |
| **D.** | 2*a* and [-2, 2] |
| **E.** | and [1, 5] |

**Question 18**

Solve the equation *f* (*x*) = 0 where .

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** | There are no solutions |

**Question 19**





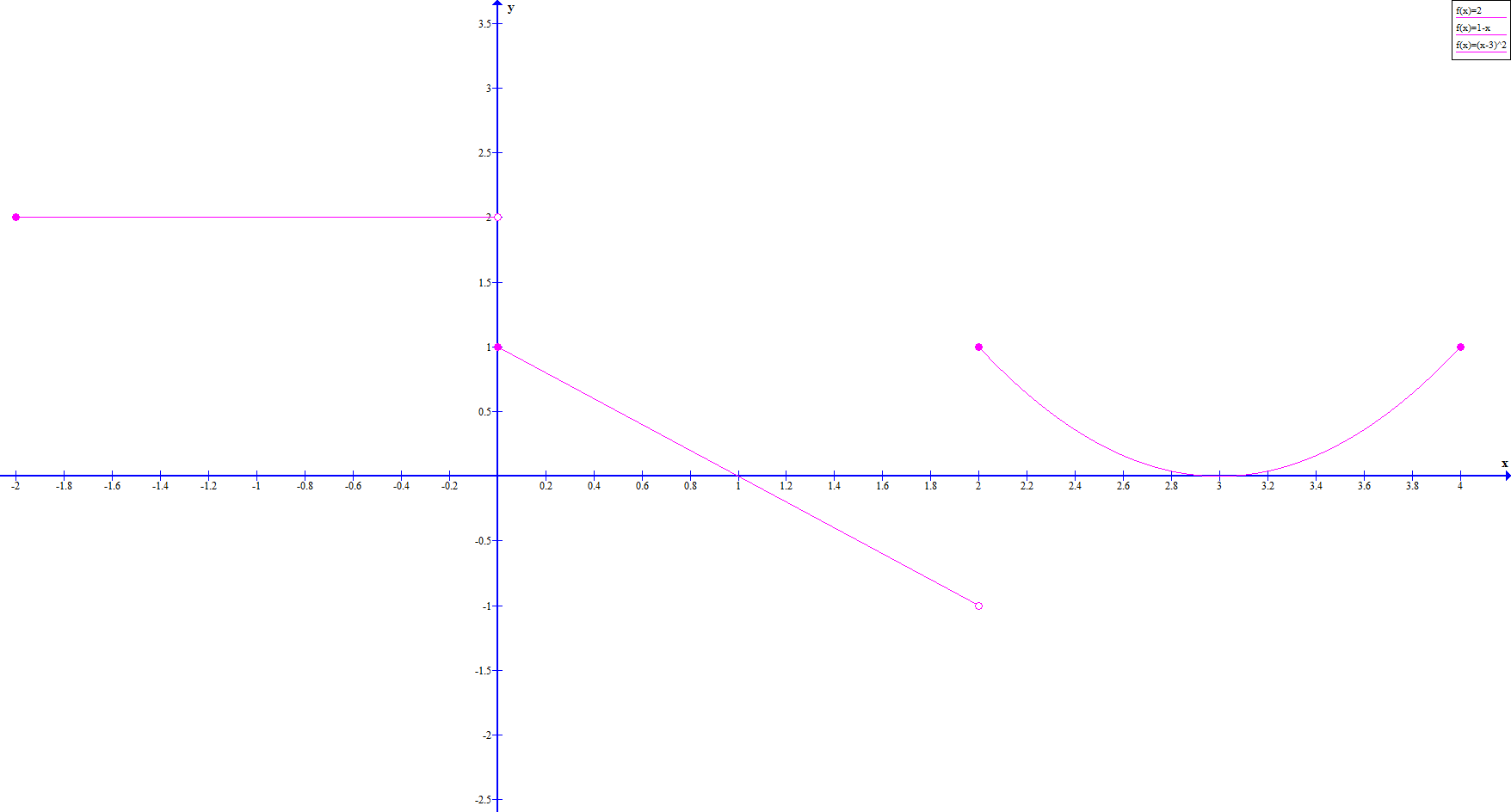
*y*

*x*

The two areas A (in the domain [0, 3]) and B (in the domain [3, 4]) are enclosed by the graphs of , and the line *x* = 4 are in the ratio

|  |  |
| --- | --- |
| **A.** | 3 : 2 |
| **B.** | 9 : 11 |
| **C.** | 11 : 8 |
| **D.** | 18 : 11 |
| **E.** | 27 : 11 |

**Question 20**



The function *f* as shown could be

|  |  |
| --- | --- |
| **A.** |  |
| **B.** |  |
| **C.** |  |
| **D.** |  |
| **E.** | *f* is not a function. |

**SECTION B**

**Instructions for Section B**

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.

**Question 1** (16 marks)

Two sheep farms are owned by Narelle and Trevor. The thickness of the wool in microns is normally distributed. The continuous variables *N* and *T* describe the wool thickness of their respective flocks.

**a. i.** . Pr (*N* < 21 = 0.1151) Find  to three decimal places. 1 mark

|  |
| --- |
|  |
|  |
|  |

**ii.** ; = 1.0. Pr (*T* > 25 = 0.8413) Find *m*. 1 mark

|  |
| --- |
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**b. i.** If the maximum width for superfine wool is *a*, and the probability that any of Narelle’s fleeces will qualify as superfine wool is 0.960, find *a* to three decimal places. 1 mark

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| --- |
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**ii.** What is the probability that a fleece from Trevor’s farm will qualify as superfine to three decimal places? 1 mark

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**iii.** Narelle has 500 sheep and Trevor 300. Find the total probability that any fleece chosen at random is superfine. 2 marks

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**iv.** Given that a fleece chosen at random is superfine, what is the probability it came from Narelle’s farm? 1 mark

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**c.** **i.** A sample of five fleeces is chosen from Trevor’s farm. Find the probability that at least four of the fleeces will qualify as superfine. (Answer to three decimal places.) 1 mark

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**ii.** The random variable **** is the proportionof superfine fleeces from Trevor’s farm. Find the 95% confidence limits of to two decimal places. 2 marks

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| --- |
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|  |

**d.** The probability density function which describes the market price for superfine wool per kilogram is:



 otherwise. Note that *x* represents units of $1000.

1. The median price is *x* = 0.4500. Calculate the constant *A*. 1 mark

|  |
| --- |
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1. The function is continuous at *x* = 0.5. Calculate the constant *B*. 1 mark

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1. Calculate the constant *l* to four decimal places. 2 marks

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**e.** The time *T* needed to shear a sheep is normally distributed with mean 5.2 minutes and variance 2.25 min². If a sheep needs more than 5 minutes to shear, find the probability (3 decimal places) that it takes less than 6 minutes. 2 marks

|  |
| --- |
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**Question 2** (11 marks)

The times of daylight during the year in Morgantown can be modelled by the function 

where *t* is the number of days after Jan 1st, 2020 and *D* is measured in minutes. Round your answers **up** to the next whole number when it comes out as a fraction or decimal.

*D* (mins)

*t (days)*

**a. i.** Find the coordinates of the equinoxes (i.e. the points where the length of daytime and night-time are equal). 2 marks

|  |
| --- |
|  |
|  |
|  |

**ii.** Find the coordinates of the solstices (i.e. the points where the hours of daylight are at their maximum and minimum). 2 marks

|  |
| --- |
|  |
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|  |

**b. i.** Give the coordinates of the point where *D(t)* is **decreasing** at its maximum rate.2 marks

|  |
| --- |
|  |
|  |
|  |

**ii.** Give the coordinates of the point where *D(t)* is **increasing** at its maximum rate.1 mark

|  |
| --- |
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|  |

**c.** The times of daylight during the year in Castleford can be modelled by the function :

*D* (mins)

*t (days)*

Find all the values of *t* for which Castleford has more daylight than Morgantown.2 marks

|  |
| --- |
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|  |

**d.** Which of Castleford and Morgantown could be expected to experience more daylight over the whole year? Justify your answer.2 marks

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| --- |
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**Question 3** (18 marks)



*y* = *f*(*x*)

*x*

**a.** Find the axis intercepts of *f* (*x*).3 marks

|  |
| --- |
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|  |

**b.** Find the coordinates of the turning points of *f*(*x*).3 marks

|  |
| --- |
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**c.** Consider the function 

**i**. Find the values of *a* for which *g*(*x*) has exactly two intercepts with the *x* axis. 2 marks

|  |
| --- |
|  |
|  |
|  |

**ii.** Find all values of *a* for which *g*(*x*) has only one intercept with the *x* axis. 1 mark

|  |
| --- |
|  |
|  |
|  |

**d.** Find the area enclosed by *f*(*x*) and the *x* axis. 2 marks

|  |
| --- |
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|  |

**e. i.** Find the equation of the tangent to *f*(*x*) at *x* = 3. 2 marks

|  |
| --- |
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|  |

**ii.** At what point does the normal at *x* = 3 cut the *y* axis? 2 marks

|  |
| --- |
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|  |

**iii.** Find the area of the quadrilateral bounded by the tangent, the normal and the axes. 3 marks

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| --- |
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**Question 4** (15 marks)



*y*

*x*

**a.** Find the axis intercepts of *f*(*x*). 3 marks

|  |
| --- |
|  |
|  |
|  |

**b.** Find the coordinates of the turning point of *f* (*x*). 2 marks

|  |
| --- |
|  |
|  |
|  |

**c.** Find the inverse function **** and state its maximal domain.3 marks

|  |
| --- |
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|  |
|  |

**d.** Consider the functions *g* and *h* and the transformation matrix *T* where T maps *g*(*x*) onto *h*(*x*):

 ; 



**i.** Find the constants *a* and *b*. 2 marks

|  |
| --- |
|  |
|  |
|  |

**ii.** Describe the transformation *T*. 1 mark

|  |
| --- |
|  |
|  |
|  |

**e. i.** Consider the function .

Find the equation of the tangent to this curve at *x = k*.2 marks

|  |
| --- |
|  |
|  |
|  |

**ii.** Find the inverse function  and state its domain.2 marks

|  |
| --- |
|  |
|  |
|  |

**END OF QUESTION AND ANSWER BOOK**

**Mathematical Methods Formulas**

**Mathematical Methods Formulas**

Mensuration:

Area of a triangle: ½ *bc* sin A

Differential Calculus: Integral Calculus:







**Multiple Choice Answer Sheet**

**Student Name:**

Shade the letter that corresponds to each correct answer.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Question** | **A** | **B** | **C** | **D** | **E** |
| Question 1 |  |  |  |  |  |
| Question 2 |  |  |  |  |  |
| Question 3 |  |  |  |  |  |
| Question 4 |  |  |  |  |  |
| Question 5 |  |  |  |  |  |
| Question 6 |  |  |  |  |  |
| Question 7 |  |  |  |  |  |
| Question 8 |  |  |  |  |  |
| Question 9 |  |  |  |  |  |
| Question 10 |  |  |  |  |  |
| Question 11 |  |  |  |  |  |
| Question 12 |  |  |  |  |  |
| Question 13 |  |  |  |  |  |
| Question 14 |  |  |  |  |  |
| Question 15 |  |  |  |  |  |
| Question 16 |  |  |  |  |  |
| Question 17 |  |  |  |  |  |
| Question 18 |  |  |  |  |  |
| Question 19 |  |  |  |  |  |
| Question 20 |  |  |  |  |  |

****

**Solution Pathway**

**NOTE: This task is sold on condition that it is NOT placed on any school network or social media site (such as Facebook, Wikispaces, etc.) at any time.**

**NOT FOR PRIVATE TUTOR USE.**

Below are sample answers. Please consider the merit of alternative responses.

**Section A: Multiple-choice answers**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1.** | **E** | **6.** | **E** | **11.** | **E** | **16.** | **C** |
| **2.** | **C** | **7.** | **C** | **12.** | **B** | **17.** | **B** |
| **3.** | **D** | **8.** | **B** | **13.** | **A** | **18.** | **A** |
| **4.** | **A** | **9.** | **E** | **14.** | **E** | **19.** | **E** |
| **5.** | **B** | **10.** | **C** | **15.** | **D** | **20.** | **D** |

**Section A: Multiple-choice solutions**

1. *P* ~ Bi (12, ⅓). Pr (*P* ≥ 3) = 1 – Pr (*P* ≤ 2) = 0.8189
2. From the sum of probabilities, 3*p + q* = 0.6, hence *q =* 0.6 *–* 3*p* and *p* ≤ 0.2

The mean is 3*q* – *p* + 0.3 = 3(0.6 *–* 3*p)* – *p* + 0.3 *=* 2.1 – 10*p*.

However, *p ≥ q* from Pr (*X* = 1), so the minimum value of *p* equals *q*, in which case:

*p =* 0.6 *–* 3*p,* therefore 4*p* = 0.6 and *p* = 0.15

Hence *p* lies between [0.15, 0.2].

If *p* = 0.15, *μ* = 0.6. If *p* = 0.2, *μ* = 0.1. Hence max value of *μ* = 0.6.

1. Pr (*X < a*) = 0.875 = 0.875



1. σ² = 25 => σ = 5*g;* Y ~ N(60, 5), so 



1. Primes from 1 to 8 are 2, 3, 5 and 7, hence . *P* ~ Bi (12, ½).

;

1. Since the cosine graph is symmetrical about the *y* axis, most of the solutions will cancel each other out. They are:  etc.

But  andlie outside the domain. Hence the solution sum is .

1. . ;  at (0, 0) and (3, 3).



1. Actual area:



Estimated area: Two rectangles of width 1 unit and height and :



1. The average value of the function  over the domain [0, *a*] is:



1. .

The chord connecting the points on the curve at *x* = 1 and *x* = 2 has a length of:

;

Rise = 2 – 1 = 1; Run = 



1. is subject to the following transformations: (a) translation of

-*b* parallel to the *y* axis (b) reflection in the *x* axis (c) dilation by a factor of *a* away from the *x* axis. The resultant function  is given by what rule?



1. The functionis subject to the following transformation *T*:









Positive root because of the domain restriction, therefore 

1. Area under the graph = 

Area of rectangle = 2, so area enclosed = 2 – (2 – )=

1. The graph is an inverted quartic with a repeated root at *x* = 1 and the other two roots at -2 and 2. Hence *f*(*x*) = -A(*x* – 1)²(*x* + 2)(*x* – 2). Students should check *f*(0) = 4 hence A = 1.
2. 



Range of *f* = domain of = [0, 2)

1. 
2. Period =  ; range =  = [1,5]
3. 



The only solution which lies inside the domain [0, π] is 

1. ; 

**A:** ; **B:** 

**A : B** = 27 : 11

1. 

**Section B: Extended Answer Solutions**

**Question 1** (16 marks)

Two sheep farms are owned by Narelle and Trevor. The thickness of the wool in microns is normally distributed. The continuous variables *N* and *T* describe the wool thickness of their respective flocks.

**a. i.** . Pr (*N* < 21) = 0.1151. Find  to three decimal places. 1 mark

Pr (*N* < 21) = 0.1151 therefore Pr (*N* < 25) = 0.8849

*Z* = 1.200



**ii.** ; = 1.0. Pr (*T* > 25 = 0.8413) Find *m*: 1 mark

Pr (*T* > 25 = 0.8413). Invnorm 0.8413 gives *Z* = 1.0000. Therefore *m* = 26.

**b. i.** If the maximum width for superfine wool is *a*, and the probability that any of Narelle’s fleeces will qualify for superfine wool is 0.960, find *a* to three decimal places. 1 mark

Invnorm 0.960 = 1.750: 

**ii.**  1 mark

**iii.** Make a probability table:

|  |  |  |  |
| --- | --- | --- | --- |
| ***Pr*** | ***S*** | ***S'*** | ***Total*** |
| ***T*** | ⅜ \* 0.533 |  | 0.375 |
| ***N*** | ⅝ \* 0.960 |  | 0.625 |
| ***Total*** |  |  | **1** |

Filling in the remaining numbers gives:

|  |  |  |  |
| --- | --- | --- | --- |
| ***Pr*** | ***S*** | ***S'*** | ***Total*** |
| ***T*** | 0.200 | 0.175 | 0.375 |
| ***N*** | 0.600 | 0.025 | 0.625 |
| ***Total*** | 0.800 | 0.200 | **1** |

*Pr(S)* = 0.8002 marks

**iv. **  1 mark

**c. i.** *S* ~ Bi (5, 0.533)

**** 1 mark

**ii.** The random variable **** is the proportionof superfine fleeces from Trevor’s farm. Find the 95% confidence limits of to two decimal places. 2 marks

*p* = 0.533, *n* = 300

**

Confidence limits are (0.47, 0.59)

**d.** The probability density function which describes the price at market for superfine wool per kilogram is given by:



*f (x)* = 0 otherwise. *x* represents units of $1000.

1. The median price is *x* = 0.4500. Calculate the constant *A*. 1 mark



1. The function is continuous at *x* = 0.5. Calculate the constant *B*. 1 mark

The two functions must have equal values at *x* = 0.5.



1. Calculate the constant *l* to four decimal places. 2 marks

The total probability must equal 1:  


**e.** The time *T* needed to shear a sheep is normally distributed with mean 5.2 minutes and variance 2.25 min². If a sheep needs more than 5 minutes to shear, find the probability (3 decimal places) that it takes less than 6 minutes. 2 marks

*T ~ N*(5.2, 2.25) and 



**Question 2** (11 marks)

The times of daylight during the year in Morgantown can be modelled by the function 

where *t* is the number of days after Jan 1st, 2020 and *D* is measured in minutes. Throughout question 2, round your answers **up** to the next whole number when it comes out as a fraction or decimal.

**a. i.** Find the coordinates of the equinoxes (i.e. the points where the length of daytime and night-time are equal). 2 marks

At the equinoxes, *D(t)* = 720 (or 12 hours):



(83, 720) and (266, 720)

**ii.** Find the coordinates of the solstices (i.e. the points where the hours of daylight are at their maximum and minimum). 2 marks

At the solstices, *D(t)* = maximum and minimum, hence:





Coordinates are (174, 570) and (357, 870)

**b. i.** Give the coordinates of the point where *D(t)* is **decreasing** at its maximum rate.2 marks

**** This function reaches its minimum value when:

****

Coordinates are (83, 720)

Students may use technology, or else take the second derivative and solve it for 

**ii.** Give the coordinates of the point where *D(t)* is **increasing** at its maximum rate.1 mark

****

Coordinates: (266, 720)

**c.** The times of daylight during the year in Castleford can be modelled by the function  where *t* = days after Jan 1st, 2020 and *D* is measured in minutes.

Find all the values of *t* for which Castleford has more daylight than Morgantown.2 marks

Students may use technology, but logic alone should indicate that the values of *t* required are the six months between the spring and autumn equinoxes: 

**d.** Which of Castleford and Morgantown could be expected to experience more daylight over the whole year? Justify your answer.2 marks

Again, logic would indicate that everywhere on earth receives the same average amount of daylight (720 minutes). However, to gain the second mark students should either mention that sine and cosine curves have equal areas above and below the median line, or else give an equation of the general form

 or equivalent.

**Question 3** (17 marks)



**a.** Find the axis intercepts of *f*(*x*).3 marks

(0,0); (-√15, 0) and (√15, 0) (1 mark each)

**b.** Find the coordinates of the turning points of *f*(*x*).3 marks

 (1 mark)

 (1 mark)

(-√5, ) and (√5, ) (1 mark)

**c.** Consider the function 

**i**. Find the values of *a* for which *g*(*x*) has exactly two intercepts with the *x* axis. 2 marks



**ii.** Find all values of *a* for which *g*(*x*) has only one intercept with the *x* axis. 1 mark



**d.** Find the area enclosed by *f*(*x*) and the *x* axis. 2 marks



**e. i.** Find the equation of the tangent to *f*(*x*) at *x* = 3: 2 marks

; gradient = 



**ii.** At what point does the normal at *x* = 3 cut the *y* axis? 2 marks

Normal has equation  and cuts the y axis at (0, 5.25)

**iii.** Find the area of the quadrilateral bounded by the tangent, the normal and the axes: 3 marks

Area of trapezium from *x* = 0 to 3:  (1 mark)

Area of triangle from *x* = 3 to 4.5: . (1 mark)

Total area =  (1 mark)

**Question 4** (15 marks)



**a.** Find the axis intercepts of *f*(*x*).3 marks

 (1 mark)

 (1 mark)

 (1 mark)

**b.**  Find the coordinates of the turning point of *f*(*x*). 2 marks

= 0 at *x* = -1 (1 mark)

hence the turning point is at (-1,1) (1 mark)

**c.** Find the inverse function **** and state its maximal domain.3 marks

 (1 mark)

 so we need the positive root. For the maximal domain we need 

(1 mark)

 (1 mark)

**d.** Consider the functions *g* and *h* and the transformation matrix *T* where T maps *g*(*x*) onto *h*(*x*).

 ; 



**i** Find the constants *a* and *b*: 2 marks

 so *a* = 1 and *b* =  (1 mark each)

**ii** Describe the transformation *T*: 1 mark

Dilation away from the *x* axis by a factor of 

**e. i.** Consider the function .

Find the equation of the tangent to this curve at *x = k*:2 marks

 (1 mark)



Equation of tangent:  (1 mark)

**ii.** Find the inverse function  and state its domain:2 marks

  (1 mark)

Domain = *R* (1 mark)