SOLUTIONS

Christ Church Grammar School

2018
UNIT TEST 5

deduct at most -1 mark for missing units and -1 mark for rounding in whole test

MATHEMATICS METHODS Year 11
Section One:
Calculator-free

Student name _____

Teacher name _____

Time and marks available for this section

Reading time before commencing work:	2 minutes
Working time for this section:	15 minutes
Marks available:	15 marks

Materials required/recommended for this section

To be provided by the supervisor
This Question/Answer Booklet
Formula Sheet

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates
No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Instructions to candidates

1. Write your answers in this Question/Answer Booklet.

2. Answer all questions.

3. You must be careful to confine your response to the specific question asked and to follow any instructions that are specific to a particular question.

4. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

5. **Show all your working clearly**. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

6. It is recommended that **you do not use pencil**, except in diagrams.

See next page

Additional working space

Question number:_____

Question 4 **(2 marks)**

Consider the curve:

$$y = 5^x$$

What is the vertical dilation that would have the same transformation effect on this curve as a horizontal translation of 3 units right?

$y = 5^{x-3}$ ✓(for giving result of transformation 3 right)

$= 5^{-3} 5^x$

$= \frac{1}{125} 5^x$

∴ vertical dilation of scale factor $\frac{1}{125}$

✓(final answer)

End of questions

Question 1 **(3 marks)**

Last year a peanut farmer produced $6 \times 10^4\ kg$ of peanuts. The peanuts each weighed an average of $8 \times 10^{-4}\ kg$. The farmer put the peanuts into boxes each containing 20000 peanuts. How many boxes of peanuts did the farmer produce last year? Give your answer in scientific form correct to two significant figures.

$6 \times 10^4 \div 8 \times 10^{-4}$

$= \frac{6}{8} \times 10^8$

$= 0.75 \times 10^8$

$= 7.5 \times 10^7$ ✓(for calculating number of peanuts)

$7.5 \times 10^7 \div 20\,000$

$= 7.5 \times 10^7 \div 2 \times 10^4$

$= 3.75 \times 10^3$

$= 3.8 \times 10^3$ boxes ✓(for calculating number of boxes)

✓(for rounding to 2 sig figs)

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Question 2 **(5 marks)**

Determine the equation of the other tangent to the curve:

$$y = 1 - 3x + 12x^2 - 8x^3$$

which is parallel to the tangent at (1,2).

$\frac{dy}{dx} = -3 + 24x - 24x^2$ ✓(for $\frac{dy}{dx}$)

at $x=1$ $\frac{dy}{dx} = -3 + 24(1) - 24(1)^2$

$= -3$ ✓(for $\frac{dy}{dx}$ at $x=1$)

∴ parallel lines require gradient must be -3

i.e. $-3+24x-24x^2 = -3$ ✓(for quadratic expression for gradient)

$\therefore 24x - 24x^2 = 0$

$x - x^2 = 0$

$x(x-1) = 0$

$x = 0, 1$

When $x=0$, $y=1$ so other point is $(0,1)$ ✓(for other point with tangent gradient -3)

So tangent is $y = -3x + c$

use $(0,1)$ $1 = -3 \times 0 + c$

$c = 1$

∴ other tangent is $y = -3x + 1$ ✓(for final answer)

Question 3 **(5 marks)**

(a) Simplify $16^{-\frac{3}{4}}$ giving your answer as a fraction. (2 marks)

$16^{-3/4} = (2^4)^{-3/4}$ ✓(for using base of 2)

$= 2^{-3}$

$= \frac{1}{8}$ ✓(for final answer)

(Note: $\frac{1}{2^3}$ is also OK)

(b) Simplify the following expression:

$$\frac{2^{2n} \times 9^{2n-1}}{6^{n-1}}$$

(3 marks)

$= \frac{2^{2n} \times (3^2)^{2n-1}}{(2\times 3)^{n-1}}$ ✓(for writing in terms of bases 2 and 3)

$= \frac{2^{2n} \times 3^{4n-2}}{2^{n-1} \times 3^{n-1}}$

$= 2^{2n-(n-1)} \times 3^{(4n-2)-(n-1)}$ ✓(for writing without denominator)

$= 2^{n+1} \times 3^{3n-1}$ ✓(for final answer)