**Test 3**

Calculus of Trigonometric Functions

Discrete Random Variables

Binomial Distributions

## Semester One 2018 Year 12 Mathematics Methods

**Calculator Assumed**

**Name:**

**Teacher:**

**Mr McClelland**

**Mrs. Carter**

**Mr Gannon**

**Ms Cheng**

**Mr Staffe**

**Mr Strain**

**Date: Wed 2nd May**

**You may have a formula sheet for this section of the test.**

**Classpad Calculators**

**1 page of Notes**

**Total\_\_\_\_\_\_\_\_\_\_\_/41 45 minutes +5 minutes READING**

**Question 1 (5 marks)**

The discrete random variable X has the probability distribution shown in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 |
|  |  |  |  |  |

Determine the value of the constant a.

**Question 2 (8 marks)**

(a) Differentiate with respect to , showing full working. (2 marks)

(b) Hence find the following indefinite integral. (3 marks)

.

And using a similar process as part (a), find the indefinite integral for

.

(c) Use the two equations from (b) to determine . (3 marks)

**Question 3 (6 marks)**

Differentiate with respect to (show full working)

(a) . (3 marks)

Evaluate the following, showing full working.

(b)  (3 marks)

**Question 4 (9 marks)**

75% of the avocados produced by a farm are known to be first grade, the rest being second grade. Trays of 24 avocados are filled at random in a packing shed and sent to market.

Let the random variable be the number of first grade avocados in a single tray.

(a) Explain why is a discrete random variable, and identify its probability distribution.

(2 marks)

(b) Calculate the mean and standard deviation of . (2 marks)

(c) Determine the probability that a randomly chosen tray contains

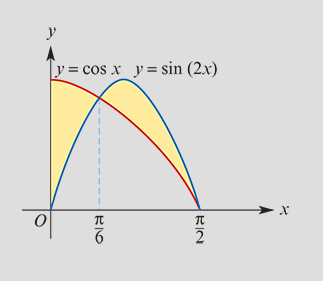
(i) 18 first grade avocados. (1 mark)

(ii) more than 15 but less than 20 first grade avocados. (2 marks)

(d) In a random sample of 1000 trays, how many trays are likely to have fewer first grade than second grade avocados. (2 marks)

**Question 5 (4 marks)**

Find the area between the two curves from , showing full algebraic reasoning.



**Question 6 (9 marks)**

**(a)** A sample of six objects is to be drawn from a large population in which 20% of the objects are defective. Find the probability that the sample contains:

(i) three defectives. (2 marks)

(ii) fewer than three defectives. (2 marks)

(b) Another large population contains a proportion of defective items.

(i) Write down an expression in terms of for the probability that a sample of six items contains exactly two defectives. (2 marks)

(ii) By differentiating to find , show that is greatest when . (3 marks)