



WESLEY COLLEGE

By daring & by doing

YEAR 12 MATHEMATICS METHODS  
Calculus, trigonometry and DRV's  
Test 3

Name: \_\_\_\_\_

Marks: \_\_\_\_\_/45

Calculator Free (20 marks)

Time allowed: 50 mins

1. [2 marks]

Determine if each of the  $p(x)$  as described are discrete probability functions. Justify your answer in either case.

a)

$x$	0	1	2	5
$P(X = x)$	0.1	0.4	0.6	0.9

b)

$x$	-3	-2	1	4
$P(X = x)$	0.1	0.3	0.2	0.4

[1]

2. [3 marks]

Given a binomial variable has a mean of 12 and a standard deviation of  $\sqrt{8}$ , find  $p$ , the probability of success and  $n$ , the number of trials.

1.

3. [10 marks]

Determine:

a)  $\frac{d}{dx}\cos^5(3x)$

[2]

b)  $\frac{d}{dx}e^{2x+1}\tan(5x)$

[2]

c)  $\int\frac{\sin(5x)}{4}dx$

[2]

d)  $\int\cos(x)\sin^3(x)dx$

[2]

e)  $\frac{d}{dx}\int_e^{x^3}\cos(3t)dt$

[2]

8. [8 marks]

A soldier fires shots at a target at distances ranging from 25 m to 90 m. The probability of him hitting the target with a single shot is  $p$ . When firing from a distance of  $d$  m,  $p = \frac{3}{200}(90 - d)$ . Each shot is fired independently.

The soldier fires 10 shots from a distance of 40 m.

- a) Determine the probability that:
- (i) Exactly 6 shots hit the target.

[3]

- (ii) At least 8 shots hit the target.

[2]

The soldier fires 20 shots from a distance of  $x$  m.

- b) Determine to the nearest integer, the value of  $x$  if the soldier has an 80% chance of hitting the target *at least once*.

[3]

7. [3 marks]

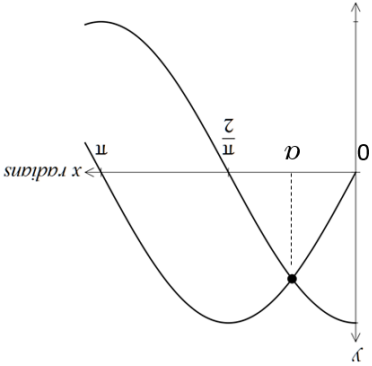
Suppose that 5% of all items coming off a production line are defective. Assume the manufacturer packages his items in boxes of six and guarantees “double your money back” if more than two items in a box are defective. On what percentage of the boxes will the manufacturer have to pay double money back?

6.

4. [5 marks]

Determine the area trapped between the functions  $y = \sin(x)$ ,  $y = \cos(x)$ ,  $x = 0$  and  $x = \pi$ .

Hint: First, determine  $a$ .



3.



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**Calculator Section (25 marks)**

**5. [6 marks]**

A company produces fruit sweets coated with either dark chocolate or milk chocolate. A large number of these fruit sweets are placed in a box. Twenty percent of the sweets in the box are coated with dark chocolate.

- a) A random sample of ten sweets is taken from the box, explain the meaning of the calculation  ${}^{10}C_4(0.2)^4(0.8)^6$  with respect to this sample?

[2]

- b) (i) Find  $n$  given that  ${}^nC_0(0.2)^0(0.8)^n = 0.16777$

[2]

- (ii) Explain the meaning of your answer from b) (i) with respect to the fruit sweets.

[2]

**6. [8 marks]**

The random variable  $X$  has probability distribution:

$x$	1	3	5	7	9
$P(X = x)$	0.2	$p$	0.2	$q$	0.15

Given that  $E(X) = 4.5$ , determine:

- a) The value of  $p$  and  $q$ .

[3]

- b)  $P(4 < x \leq 7)$

[1]

Given that  $E(X^2) = 27.4$ , determine:

- c)  $Var(X)$

[2]

- d)  $E(19 - 4X)$

[1]

- e)  $Var(19 - 4X)$

[1]