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

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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	0.1	0.4	0.6

[1]

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.

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]

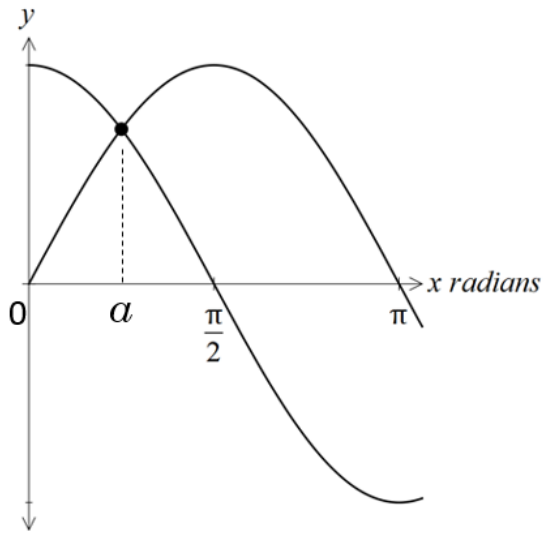
e) $\frac{d}{dx}\int_e^{x^3}\cos(3t)\,dt$

[2]

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.



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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 ${}^{n}C_0(0.2)^0(0.8)^n = 0.16777$

[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]

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?

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]