Name: _____   Tutorial Class: _____

ANGLO-CHINESE JUNIOR COLLEGE
MATHEMATICS DEPARTMENT

MATHEMATICS
Higher 1   **8865**

                                                        19 March 2024
JC2 LCP2A (25 marks)   Time allowed**: 45 mins**

List MF26

Standard discrete distributions

Distribution of X	P($X = x$)	Mean	Variance
Binomial B(n, p)	$\binom{n}{x} p^x (1-p)^{n-x}$	np	$np(1-p)$

1   Find algebraically the set of values of t for which

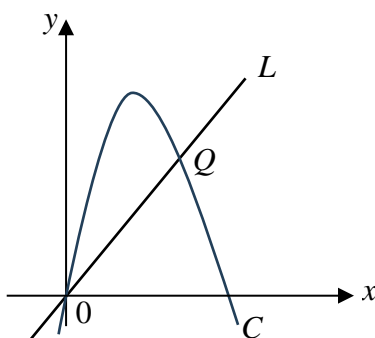$$3x^2 - 3tx + (t^2 - t - 3) > 0$$

for all real values of x.   [3]

2   Find

(i) $\displaystyle\int \frac{\left(3e^{2x} + 1\right)^2}{e^x} \, dx$ [2]

(ii) $\displaystyle\int \frac{1}{\sqrt{9x-4}} \, dx$ [2]

3 The diagram shows the curve C with equation $y = x(k-x)$, where $k > 4$ and the line L with equation $y = 2x$. The x-coordinate of point Q where C and L intersect is $k - 2$.

Given that the exact area of the region bounded by C, L and the x-axis is $\dfrac{49}{3}$, find the value k. [5]

4 Sunrise Company produces lemons and sells them in bags of 6. The 6 lemons are randomly chosen from a large supply. The probability that a lemon is rotten is 0.2.

(i) State, in context, two assumptions needed for the number of rotten lemons in a bag to be well modelled by a binomial distribution. [2]

Assume now that the number of rotten lemons in a bag follows a binomial distribution.

(ii) Find the most likely number of rotten lemons that can be found in a randomly selected bag. [1]

(iii) Find the probability that, in a randomly selected bag of lemons, there is more than 2 rotten lemons, given that there is at most 4 rotten lemons. [3]

The probability that a lemon is rotten is 0.2. A bag of lemons is discarded if more than 70% of the lemons are rotten.

(iv) Find the probability that a randomly selected bag of lemons will be discarded. [2]

(v) 30 bags are chosen at random, find the probability that none of the bags of lemons will be discarded. [2]

Sunrise Company changed its packaging material to prevent the lemons from rotting. The lemons are still sold in bags of 6 and the new probability that a lemon is rotten is p.

(vi) It is given that for a randomly selected bag, the probability that at least one lemon is rotten is 0.7. Write down an equation in terms of p, and find the value of p. [3]

Summary of Areas for Improvement			
Knowledge (K)	**Careless Mistakes (C)**	**Read/Interpret Qn wrongly (R)**	**Presentation (P)**