○ حاضر
○ غائب

Sultanate Of Oman
Ministry Of Education

امتحان شهادة دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)
للعام الدراسي ١٤٣٤/١٤٣٥هـ - ٢٠١٣/٢٠١٤م
الدور الأول - الفصل الدراسي الأول

- المادة: الرياضيات (ثنائية اللغة).
- الإسئلة في (١٥) صفحة.
- زمن الاجابة: ثلاث ساعات
- الإجابة في الورقة نفسها

تعليمات وضوابط التقدم للامتحان:

- الحضور إلى اللجنة قبل عشر دقائق من بدء الامتحان للأهمية.
- إبراز البطاقة الشخصية لمراقب اللجنة.
- يمنع كتابة رقم الجلوس أو الاسم أو أي بيانات أخرى تدل على شخصية الممتحن في دفتر الامتحان ، وإلا ألغي امتحانه.
- يحظر على الممتحنين أن يصطحبوا معهم بمركز الامتحان كتبا دراسية أو كراسات أو مذكرات أو هواتف محمولة أو أجهزة النداء الآلي أو أي شيء له علاقة بالامتحان كما لايجوز إدخال آلات حادة أو أسلحة من أي نوع كانت أو حقائب يدوية أو آلات حاسبة ذات صفة تخزينية.
- يجب أن يتقيد المتقدمون بالزي الرسمي(الدشداشة البيضاء والمصر أو الكمة للطلاب والدارسين والزي المدرسي للطالبات واللباس العماني للدارسات) ويمنع النقاب داخل المركز ولجان الامتحان.
- لا يسمح للمتقدم المتأخر عن موعد بداية الامتحان بالدخول إلا إذا كان التأخير بعذر قاهر يقبله رئيس المركز وفي حدود عشر دقائق فقط.
- يتم الالتزام بالإجراءات الواردة في دليل الطالب لأداء امتحان شهادة دبلوم التعليم العام.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (○) وفق النموذج الآتي:

س – عاصمة سلطنة عمان هي:

○ القاهرة. ○ الدوحة.
● مسقط. ○ أبو ظبي.

ملاحظة: يتم تظليل الشكل (●) باستعمال القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ● غير صحيح ⊘ ⊗ ◒ ◉ ○

لاتكتب في هذا الجزء

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مُسَوَّدَة، لايتم تصحيحها

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Formulae sheets on pages 16-17

Question One : (28 marks)

There are 14 multiple-choice items worth two marks each.
Shade in the (◯) next to the correct answer for each of the following items.

1) If $y = 7x + 9$, then $\frac{dy}{dx} =$

◯ $7x$ ◯ $x + 9$

◯ 7 ◯ 9

2) The equation of the tangent to curve $f(x) = 3x^2 - 2x + 4$ *at* $x = 0$ *is :*

◯ $y = -2x + 4$ ◯ $y = \frac{-1}{6}x - 2$

◯ $y = \frac{1}{2}x + 4$ ◯ $y = 6x - 2$

3) If $\frac{d^2y}{dx^2} = 12x^2 - 4$ and the stationary points of y are at $x = 0, 1$ and -1, then the maximum point(s) at $x =$

◯ $-1, 0$ ◯ 0

◯ 1 ◯ $0, 1$

4) If $\frac{1}{x^2 + 2x - 3} = \frac{A}{(x + 3)} + \frac{B}{(x - 1)}$, then $4B =$

◯ -1 ◯ $-\frac{1}{4}$

◯ $\frac{1}{4}$ ◯ 1

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5) If two fair spinners each with four faces numbered 1 to 4 are thrown together and the product of numbers indicated on each spinner is recorded, what is the probability of the spinners indicating a product which is square and even ?

○ $\frac{1}{8}$ ○ $\frac{3}{16}$

○ $\frac{1}{4}$ ○ $\frac{3}{4}$

6) In a group of 20 men and 12 women, half of the men have black eyes and a third of the women have black eyes. If a person is chosen randomly, what is the probability that the person is a women or black eyes?

○ $\frac{26}{32}$ ○ $\frac{22}{32}$

○ $\frac{14}{32}$ ○ $\frac{12}{32}$

7) If $y = 1 + 0.4 \sec \theta$, and $\theta = \pi$, then the value of y equals:

○ -1.4 ○ -0.6

○ 0.6 ○ 1.4

8) If $3 \tan^2 x = 1$, then the values of x (where $90° < x < 270°$) are :

○ $150°, 210°$ ○ $120°, 240°$

○ $150°, 240°$ ○ $120°, 210°$

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9) If $\sin 2\theta \neq 0$, then $\frac{2\cos^2\theta}{\sin 2\theta} - \cos ec\ 2\theta$ equals:

○ $\tan 2\theta$ ○ $\tan^2\theta$

○ $\cot 2\theta$ ○ $\cot^2\theta$

10) If $\cos A \sin^2 A = \frac{8}{\cos ecA}$, then $\sin 2A =$

○ 4 ○ 8

○ 10 ○ 16

11) $\int \frac{1}{\sqrt{x}} dx =$

○ $2\sqrt{x} + c$ ○ $\frac{1}{2}\sqrt{x} + c$

○ $\frac{3}{2}\sqrt{x^2} + c$ ○ $\frac{3}{2}\sqrt{x^3} + c$

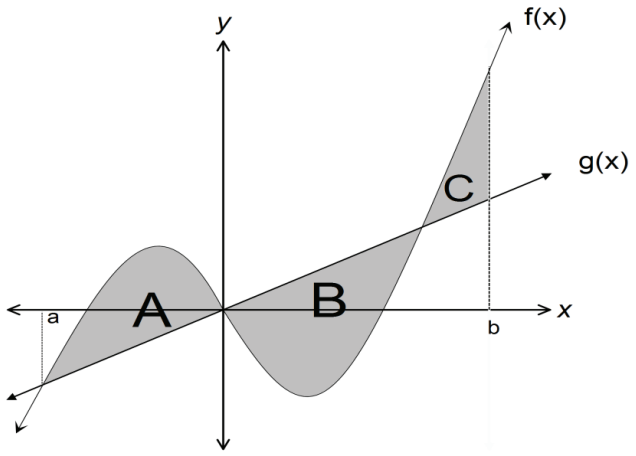
12) If $f(x) = \int x^{-2} dx,\ f(1) = 1$, then $f(x) =$

○ $-\frac{1}{x} - 2$ ○ $-\frac{1}{x} - 1$

○ $-\frac{1}{x} + 1$ ○ $-\frac{1}{x} + 2$

13) Consider the sketch below.
If A = 4, B = 5, and C = 2 are three areas, then $\int_a^b \big(f(x) - g(x)\big)\,dx =$

- ○ -1
- ○ 1
- ○ 6
- ○ 11



14) $\int_0^1 \frac{x^3 - x^2 + x - 1}{x - 1}\,dx =$

- ○ $-\frac{1}{12}$
- ○ $\frac{1}{3}$
- ○ $\frac{11}{12}$
- ○ $\frac{4}{3}$

EXTENDED QUESTIONS

Write your answers for each of the three questions in the space provided. Be sure to show all your work and the correct units where applicable.

Question Two : (14 marks)

a) i. If $\frac{x^2}{x^2-1} = A + \frac{B}{x^2-1}$, compute $A + B$ **(3 marks)**

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ii. Express $\frac{x-35}{(x-1)(x+5)}$ in partial fractions. **(3 marks)**

b) Differentiate $f(x) = (x+3)^2 + 2x - 1$ with respect to x. **(3 marks)**

c) Express $\sin\theta - \sqrt{3}\cos\theta$ in the form $R\sin(\theta + \alpha)$ and calculate its minimum value. **(5 marks)**

Question Three : **(14 marks)**

a) i. Given that $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = 2x^2 - 1$, calculate $f'(5)$.

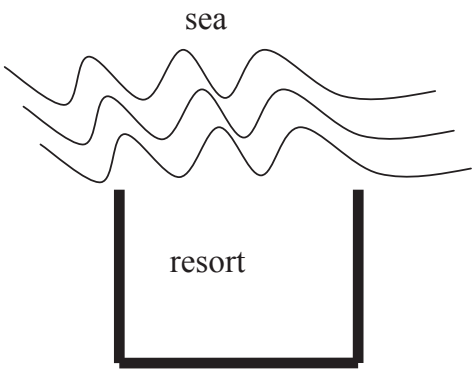
(2 marks)

ii. Prove that $6y + x - 7 = 0$ is the equation for the normal to curve $f(x) = 2x^3 - 1$ at the point $(1,1)$. **(2 marks)**

b) i. Determine the range of values of x for which y is decreasing, if $y' = 12x^2 - 4x^3$. **(3 marks)**

ii. A rectangular resort is to be constructed with one side open to the sea. A security fence is required along the remaining 3 sides of the resort. What is the maximum area that can be enclosed with 800 m of fencing?

(3 marks)



c) i. Calculate $\int x^{0.01}\,dx$.

(2 marks)

ii. Given that $f''(x) = 6x$, $f'(0) = 0$ and $f(1) = 0$, Calculate $f(x)$.

(2 marks)

Question Four : (14 marks)

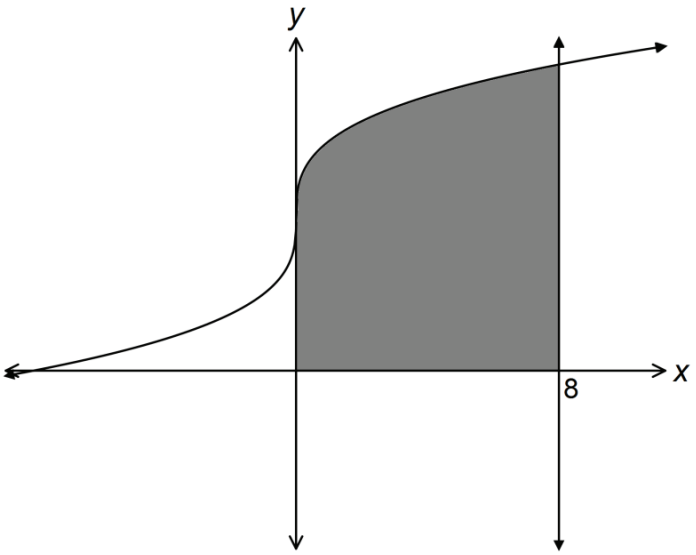
a) i. If $\sin A = \frac{12}{13}, \cos A = \frac{5}{13}, \sin B = \frac{8}{10}, \cos B = \frac{6}{10}$,
Calculate $\tan (A - B)$. **(3 marks)**

ii. Prove that $(1 - \frac{1}{\cos ec\ x})^2 + \cos^2 x = 2 - 2\sin x$

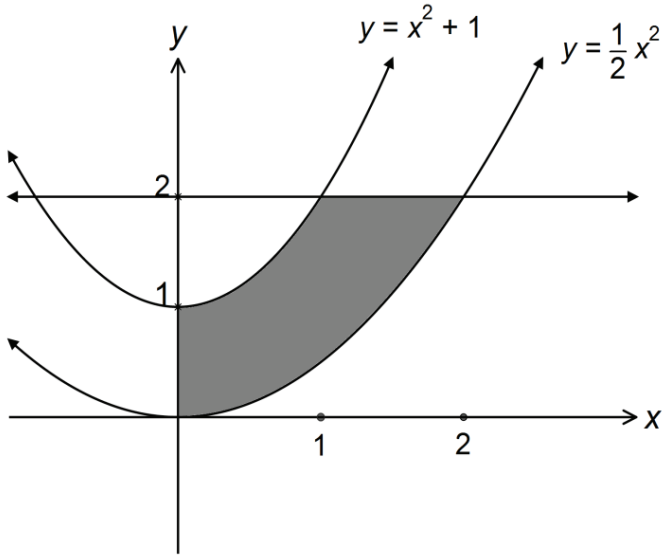
(3 marks)

b) i. Calculate an approximation to the area bounded by axes: $x = 8$ and $y = \sqrt[3]{x} + 1$. Use the Trapezium Rule with one strip.

(2 marks)



ii. From the diagram below, calculate the shaded area. **(2 marks)**



C) i. A coin is flipped first and then a six-sided die is thrown. The results are recorded. Draw a tree diagram to represent this information.

(1 mark)

ii. In a set of exam results, the percentage of success in Physics is 70% and in Maths 80% and in both subjects is 65%. If a student is chosen randomly, what is the probability that he will fail in Maths if he fails in Physics ?

(3 marks)

END OF THE EXAMINATION

Formula sheet for semester 1

Differentiation:

1. $y = x^n,\ \dfrac{dy}{dx} = nx^{(n-1)} \qquad n \in \mathrm{R}$
2. $f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$
3. $y = kx^n, \qquad \dfrac{dy}{dx} = knx^{(n-1)} \qquad n \in \mathrm{R}$
4. $y = f(x) \pm g(x), \qquad \dfrac{dy}{dx} = f'(x) \pm g'(x)$
5. $y = k f(x), \qquad \dfrac{dy}{dx} = k f'(x)$
6. Area and Volume of a cuboid with length, width and height as $l, w,$ and h respectively.
   $Area = 2lw + 2wh + 2lh \qquad Volume = l \times w \times h$
7. Area and Volume of a cylinder with radius r and height h.
   $Area = 2\pi \mathrm{r\,h} + 2\pi \mathrm{r}^2 \qquad Volume = \pi r^2 h$
8. Area and Volume of a sphere with radius r.
   $Area = 4\pi \mathrm{r}^2 \qquad Volume = \dfrac{4}{3}\pi r^3$

Trigonometry:

Pythagorean Formulas

1. $\sin^2 A + \cos^2 A = 1$
2. $\sec^2 A = 1 + \tan^2 A$
3. $\cos ec^2 A = 1 + \cot^2 A$

Double Angle Formulas:

1. $\sin 2A = 2\sin A \cos A$
2. $\cos 2A = \cos^2 A - \sin^2 A$
   $\cos 2A = 2\cos^2 A - 1$
   $\cos 2A = 1 - 2\sin^2 A$
3. $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

Compound Angle Formulas:

1. $\sin(A + B) = \sin A \cos B + \cos A \sin B$
2. $\sin(A - B) = \sin A \cos B - \cos A \sin B$
3. $\cos(A + B) = \cos A \cos B - \sin A \sin B$
4. $\cos(A - B) = \cos A \cos B + \sin A \sin B$
5. $\tan(A + B) = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}$
6. $\tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

Half Angle Formulas:

1. $\sin^2 \dfrac{1}{2}A = \dfrac{1}{2}(1 - \cos A)$
2. $\cos^2 \dfrac{1}{2}A = \dfrac{1}{2}(1 + \cos A)$
3. $\sin^2 A = \dfrac{1}{2}(1 - \cos 2A)$
4. $\cos^2 A = \dfrac{1}{2}(1 + \cos 2A)$

The form $a\cos\theta + b\sin\theta : a\cos\theta + b\sin\theta$ can be expressed in the form $R\cos(\theta \pm \alpha)$ or $R\sin(\theta \pm \alpha)$ where $\mathrm{R} = \sqrt{a^2 + b^2}, and\ \tan\alpha = \pm\dfrac{b}{a} or\ \tan\alpha = \pm\dfrac{a}{b}$

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Integration:

1) $\int x^n dx = \frac{x^{(n+1)}}{n+1} + c, n \neq -1$

2) $\int [f(x) \pm g(x)]\, dx = \int f(x)\, dx \pm \int g(x)\, dx$

3) $\int kf(x)\, dx = k \int f(x)\, dx$

4) Area and volume of solids of revolution

$$Area = \int_a^b f(x)\, dx$$

$$Volume = \pi \int_a^b (f(x))^2\, dx$$

5) Trapezium rule

$$\int_a^b f(x) dx = \frac{h}{2}[y_0 + y_n + 2(y_1 + y_2 + \ldots\ldots + y_{n-1})$$

Probability:

1) Addition Rule:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

2) Conditional Probability:

$$P(A \text{ given } B) = P(A|B) = \frac{P(A \cap B)}{P(B)}$$

3) Multiplication Rule:

$$P(A \cap B) = P(A|B) \times P(B) \text{ or } P(B|A) \times P(A)$$

4) Independent Rule:

A and B are independent if:

$$P(A|B) = P(A) \text{ or } P(B|A) = P(B) \text{ or } P(A \cap B) = P(A) \times P(B)$$

5) Mutually Exclusive Rule:

A and B are Mutually Exclusive if:

$$P(A \cap B) = 0$$

6) $\frac{P(B' \cap A')}{P(A')} = \frac{1 - P(B \cup A)}{1 - P(A)}$

7) $P(B \cap A') = P(A) - P(A \cap B)$

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SULTANATE OF OMAN
MINISTRY OF EDUCATION
GENERAL EDUCATION DIPLOMA
BILINGUAL PRIVATE SCHOOLS
Marking Guide Of First Semester Examination – Mathematics
First Session – 2013/2014

(Multiple Choice)	
Answer	**Mark**

Answers For Question One:

Question No.	Answer	Page
1	7	155
2	$y = -2x + 4$	161
3	0	234
4	1	187
5	$\frac{1}{4}$	88
6	$\frac{22}{32}$	83
7	0.6	46
8	150 ,210	50
9	$\cot 2\theta$	49
10	16	66
11	$2\sqrt{x} + c$	167
12	$-\frac{1}{x}+2$	166
13	1	338
14	$\frac{4}{3}$	330

14 X 2 = 28 marks

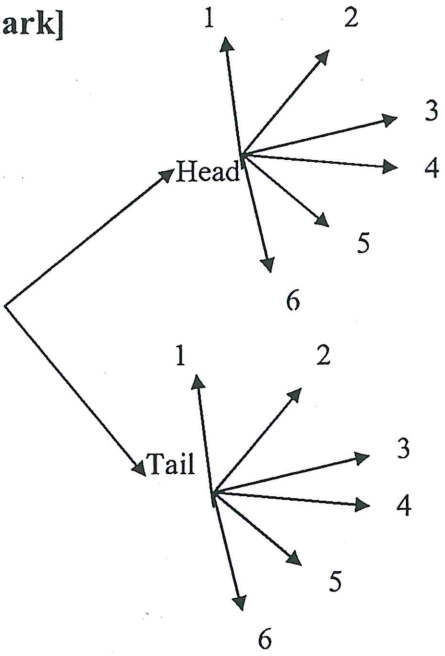
(Extended Questions)		
Answer	**Mark**	**Page**
QUESTION TWO (14 marks)		
a) i. [3 marks]		187
$\frac{x^2}{x^2-1} = A + \frac{B}{x^2-1}$		
$x^2-1 \overline{)\, x^2}$ $x^2 - 1$ 1	1	
$\frac{x^2}{x^2-1} = 1 + \frac{1}{x^2-1}$	1	
$A + B = 1 + 1 = 2$	1	
Another solution		
$\frac{x^2}{x^2-1} = \frac{x^2-1+1}{x^2-1} = 1 + \frac{1}{x^2-1}$	1	187
$\Rightarrow A = B = 1$	1	
$\therefore A + B = 1 + 1 = 2$	1	
ii. [3 marks]		
$\frac{x-35}{(x-1)(x+5)} = \frac{A}{x-1} + \frac{B}{x+5}$	$\frac{1}{2}$	
$x - 35 = A(x+5) + B(x-1)$	$\frac{1}{2}$	
Putting $x = 1$		
$-34 = 6A$		
$A = \frac{-34}{6} = \frac{-17}{3}$	$\frac{1}{2}$	
Putting $x = -5$		
$-40 = -6B$		
$B = \frac{40}{6} = \frac{20}{3}$	$\frac{1}{2}$	
S0		
$\frac{x-35}{(x-1)(x+5)} = \frac{-17}{3(x-1)} + \frac{20}{3(x+5)}$	1	

(Extended Questions)		
Answer	**Mark**	**Page**
b) [3 marks]		158
$f(x) = (x+3)^2 + 2x - 1 = x^2 + 8x + 8$	1	
$f'(x) = 2x + 8$	2	
c) [5 marks]		76
$\sin\theta - \sqrt{3}\cos\theta \equiv R\sin(\theta + \alpha)$		
$\equiv R\sin\theta\cos\alpha + R\sin\alpha\cos\theta$		
$1 = R\cos\alpha$		
$-\sqrt{3} = R\sin\alpha$		
$R = \sqrt{3+1} = 2$	$1\frac{1}{2}$	
$\tan\alpha = -\frac{\sqrt{3}}{1}, \alpha = 300$	$1\frac{1}{2}$	
$\sin\theta - \sqrt{3}\cos\theta \equiv 2\sin(\theta + 300)$	1	
the minimum value is -2	1	
QUESTION THREE (14 marks)		153
a) i. [2 marks]		
$f'(5) = 2(5)^2 - 1 = 49$	1+1	
ii. [2 marks]		
$f'(x) = 6x^2$	$\frac{1}{2}$	162
$f'(1) = 6$		
The gradient of the tangent =6		
The gradient of the normal $= \frac{-1}{6}$	$\frac{1}{2}$	
The equation of the normal		
$y - 1 = \frac{-1}{6}(x - 1)$		
$y = \frac{-1}{6}x + \frac{7}{6} \quad \times 6$		
$6y = -x + 7$		
$6y + x - 7 = 0$	1	

(Extended Questions)		
Answer	**Mark**	**Page**
b) i) [3 marks] $12x^2 - 4x^3 = 0$ $x^2(12 - 4x) = 0$ $x = 0$ or $x = 3$ Value of x: e.g $x = -1$ | 0 | e.g $x = 1$ | 3 | e.g $x = 4$ Sign of y': ++++++ | 0 | +++++ | 0 | ----- y is decreasing at $x>3$ **Hint: if the student represent the table only give him 2 marks only.**	$\frac{1}{2}$ $\frac{1}{2}$ 1 1	253
b) ii)[3 marks] $Area = xy$ $A = xy$ the fence we need $= 2x + y$ $800 = 2x + y$ $y = 800 - 2x$ $A = x(800 - 2x)$ $= 800x - 2x^2$ $A' = 800 - 4x$ $800 - 4x = 0$ $x = 200$ Value of x: e.g x=100 | e.g x=200 | e.g x=300 Sign of A': +++++ | 0 | ------ At x=200 have maximum value of Area x=200 y=400 Area=200 (400)=80000 m^2	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	242

(Extended Questions)		
Answer	**Mark**	**Page**
c) i) [2 marks]		167
$\int x^{0.01}\,dx = \frac{x^{1.01}}{1.01} + c$	1+1	
c) ii) [2 marks]		
$f'(x) = \int 6x\,dx = 3x^2 + c$	$\frac{1}{2}$	168
Since $f'(0) = 0 \Rightarrow c = o$	$\frac{1}{2}$	
$f'(x) = 3x^2$		
$f(x) = \int 3x^2\,dx = x^3 + c$	$\frac{1}{2}$	
Since $f(1) = 0 \Rightarrow 0 = 1 + c$	$\frac{1}{2}$	
$\therefore c = -1. \Rightarrow f(x) = x^3 - 1$		
QUESTION FOUR (14 marks)		60
a) i) [3 marks]		
$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$		
$\tan A = \frac{12}{5}, \tan B = \frac{8}{6}$	1	
$\tan(A-B) = \frac{\frac{12}{5} - \frac{8}{6}}{1 + \frac{12}{5} \times \frac{8}{6}} = \frac{\frac{16}{15}}{\frac{21}{5}} = \frac{16}{63}$	1 1	
≈ 0.25		
a) ii) [3 marks]		66
$(1 - \frac{1}{\cos ecx})^2 + \cos^2 x = 2 - 2\sin x$		
$(1-\sin x)^2 + \cos^2 x$	1	
$1 - 2\sin x + \sin^2 x + \cos^2 x$	1	
$1 - 2\sin x + 1$		
$2 - 2\sin x$	1	

(Extended Questions)		
Answer	**Mark**	**Page**
Another possible Solution $(1-\frac{1}{\cos ecx})^2+\cos^2 x=(1-\sin x)^2+(1-\sin^2 x)$ $=1-2\sin x+\sin^2 x+1-\sin^2 x$ $=2-2\sin x$	1+1 1	
Another possible Solution $2-2\sin x=1-2sinx+\sin^2 x+1-\sin^2 x$ $=(1-\sin x)^2+(1-\sin^2 x)$ $=(1-\frac{1}{\text{cosecx}})^2+\cos^2 x$	1+1 1	
b) i) [2 marks] $y=\sqrt[3]{x}+1$ $h=\frac{8-0}{1}=8$ $y_o=\sqrt[3]{0}+1=1$ $y_1=\sqrt[3]{8}+1=3$ $A\approx\frac{h}{2}[y_o+y_1]$ $\approx\frac{8}{2}[1+3]$ ≈ 16	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	340
b) ii. [2 marks] $A=\int_0^1\left(x^2+1-\frac{1}{2}x^2\right)dx+\int_1^2\left(2-\frac{1}{2}x^2\right)dx$ $=\left[\frac{1}{6}x^3+x\right]_0^1+\left[2x-\frac{1}{6}x^3\right]_1^2$ $=\left(\frac{1}{6}+1\right)-0+\left(4-\frac{4}{3}\right)-\left(2-\frac{1}{6}\right)$ $=3-1=2$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	336

(Extended Questions)		
Answer	**Mark**	**Page**
Another possible solution $A = \int_0^2 \left(2 - \frac{1}{2}x^2\right) dx - \int_0^1 2 - (x^2+1)\, dx$ $= \left[2x - \frac{1}{6}x^3\right]_0^2 - \left[x - \frac{1}{3}x^3\right]_0^1$ $= \left(4 - \frac{4}{3}\right) - \left(1 - \frac{1}{3}\right)$ $= 3 - 1 = 2$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
c) i.[1 mark]  	1	91
c) ii. [3 marks] A: success in physics , B: success in math $P(A) = 0.7$ $P(B) = 0.75$ $P(B'\|A') = \frac{P(B' \cap A')}{P(A')}$ $= \frac{1 - P(B \cup A)}{P(A')}$ $= \frac{1 - [P(A) + P(B) - P(B \cap A)]}{1 - P(A)}$ $= \frac{1 - [0.7 + 0.8 - 0.65]}{1 - 0.7}$ $= \frac{0.15}{0.3} = 0.5$	1 1 1	94

(End of the Marking Guide)