

Question 1 (15 Marks)

Marks

(a) Integrate with respect to x :

(i) $x^2 - \sqrt{x}$ 2

(ii) $\sin 8x$ 2

(iii) $\frac{6}{1-3x}$ 2

(b) Evaluate:

(i) $\int_0^3 e^{2x+1} dx$ 2

(ii) $\int_0^\pi \cos\left(\frac{1}{4}x\right) dx$ 2

(iii) $\int_1^4 \frac{2x^2 - 3}{x} dx$ 2

(c) (i) Evaluate $\sum_{r=1}^5 r^2$ 1

(ii) Find the sum of the first 200 terms of the arithmetic series: $3 + 7 + 11 + 15 + \dots$ 2

Question 2 (15 Marks)

Marks

(a) Find:

(i) $\int (3x - 2)^8 dx$ 2

(ii) $\int \frac{e^{3x}}{5 + e^{3x}} dx$ 2

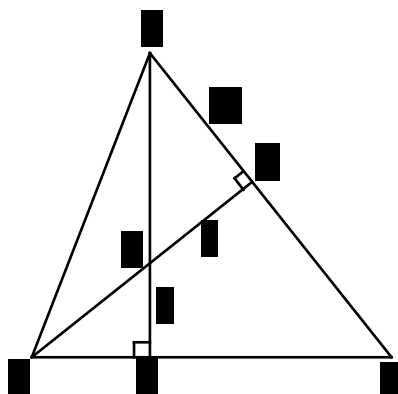
(b) (i) Sketch the curve $y = 6x - x^2$. Clearly show its intercepts with the coordinate axes. 2

(ii) Find the area bounded by the curve $y = 6x - x^2$ and the x -axis. 3

(c) In $\triangle ABC$, $AP \perp BC$ and $BQ \perp AC$.

(i) Prove that $\triangle AQR \parallel \triangle BPR$. 3

(ii) If $AQ = 12$, $RQ = 9$ and $RP = 6$, find the area of $\triangle ABR$. 3



Question 3 (15 Marks)

Marks

- (a) The area bounded by the curve $y = \sqrt{4-x}$ and the coordinate axes is rotated one revolution about the y -axis. Find the volume of the solid formed. **3**
- (b) (i) Show that the curves $y = \cos x$ and $y = \sin 2x$ meet at a point where $x = \frac{\pi}{6}$. **2**
- (ii) On the same set of axes draw a neat half page diagram of the curves $y = \cos x$ and $y = \sin 2x$ for $0 \leq x \leq \frac{\pi}{2}$ clearly showing their points of intersection. **2**
- (iii) Find the area bounded by the above curves for $0 \leq x \leq \frac{\pi}{2}$. **3**
- (c) Mr. Green sets up a fund to pay for a future holiday by paying \$500 into the fund at the start of each month. The fund pays 0.5% interest at the end of each month on the balance of money in the fund.
- (i) Find the value of the fund at the end of the first year. **2**
- (ii) How long must Mr. Green pay into the fund if he needs \$20000 for his holiday. Give your answer to the nearest month. **3**

Question 4 (15 Marks)

Marks

- (a) An artist decides to make a design showing a sequence of concentric rope circles. The inner most circle has a radius of 40 cm and each extra circle has a radius that is 10 cm larger than the radius of the previous circle.
- (i) Find the amount of rope used to make the tenth circle. Give your answer to the nearest metre. **2**
- (ii) If the artist has 2 km of rope, how many complete circles will be in the design? **3**
- (b) (i) Given that $f(x) = \ln(\cos 2x)$, find $f'(x)$. **1**
- (ii) Prove that the equation of the tangent to $y = \tan 2x$ at the point $P(\frac{\pi}{8}, 1)$ has the equation $y = 4x + 1 - \frac{\pi}{2}$. **3**
- (iii) Find the coordinates of Q , the point where the tangent at P crosses the x -axis. **1**
- (iv) On a neat half page diagram, sketch the curve $y = \tan 2x$ for $0 \leq x \leq \frac{\pi}{4}$ and the tangent at P . **2**
- (v) Find the area bounded by the curve $y = \tan 2x$, the tangent at P and the x -axis. Express your answer in the form $a + b \ln(2)$, where a and b are rational numbers. **3**

This is the end of the Examination Paper