

Question 1: (15 marks)

Marks

a) Integrate with respect to x :

i) $(7 - 2x)^5$

1

ii) $\frac{x^4 - 1}{x\sqrt{x}}$

2

b) Find the exact value of:

i) $\int_1^2 (t + t^{-1})^2 dt$

3

ii) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (x + \cos \frac{x}{2}) dx$

3

c) i) Find the points of intersection of $y = x^2 - 4$ and $2x - y - 1 = 0$.

3

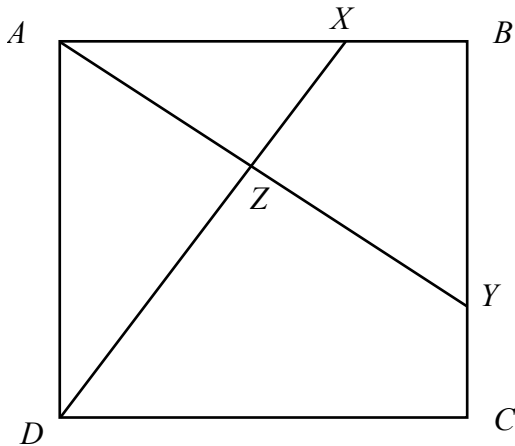
ii) On a number plane shade the intersection of the regions described by:

3

$$y \geq x^2 - 4 \text{ and } 2x - y - 1 = 0$$

Question 2: (15 marks) Start a new page.

a) $ABCD$ is a square. X and Y are points on AB and BC respectively such that $AY = DX$.

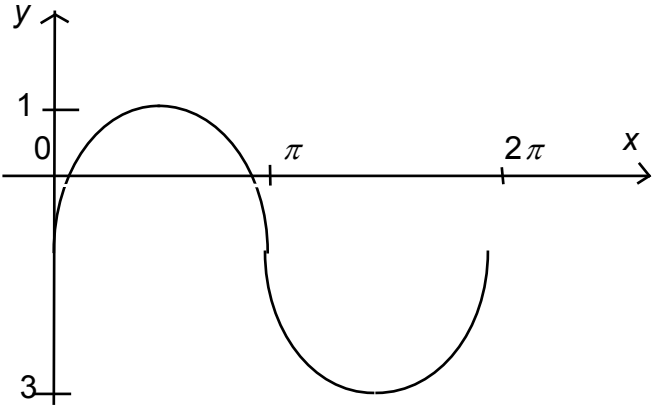


i) Copy the diagram and prove that $\triangle ABY \cong \triangle ADX$

3

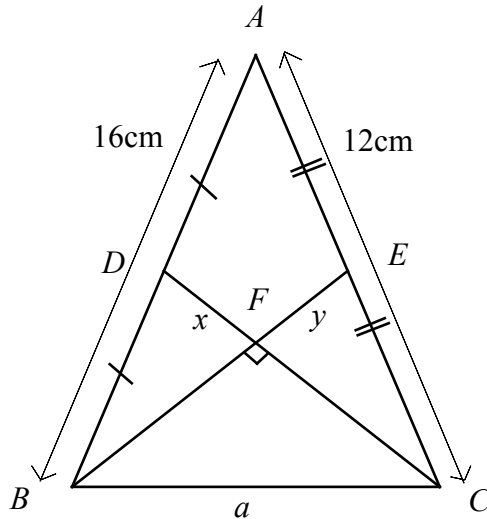
ii) Hence or otherwise prove that AY and DX intersect at right-angles.

2

	Marks
<p>Question 2 (continued)</p> <p>b) Calculate the area bounded by the coordinate axes and the curve $\sqrt{x} + \sqrt{y} = 2$.</p> <p>c) Find the sum of all numbers ending in 3 between 1000 and 2000.</p> <p>d) Sketch the graph of $y = \frac{2x-3}{x+1}$, showing all asymptotes and intercepts.</p>	<p>4</p> <p>3</p> <p>3</p>
<p>Question 3: (15 marks) Start a new page.</p> <p>a) The graph shows the function $y = 2 \sin x - 1$ for $0 \leq x \leq 2\pi$.</p>  <p>i) Find the x intercepts of the function for $0 \leq x \leq 2\pi$.</p> <p>ii) Calculate the exact value of the shaded area.</p> <p>b) A balloon is being inflated so that the volume of air pumped into the balloon in any one minute is 20% more than the volume of air that was pumped in during the previous minute.</p> <p>i) Write an expression for the volume ($V \text{ m}^3$) of the balloon at the end of 2 minutes, if the volume of air pumped into the balloon in the first minute is $V_0 \text{ m}^3$.</p> <p>ii) If the volume of the balloon after 10 minutes is 12 m^3, how much air was pumped into the balloon in the first minute?</p>	<p>3</p> <p>3</p> <p>1</p> <p>3</p>

Question 3 (continued)

- c) In $\triangle ABC$, D and E are midpoints of sides AB and AC respectively. CD and BE intersect at right angles at point F .



$AB = 16 \text{ cm}, AC = 12 \text{ cm}$ and $BF: EF = CF: DF = 2:1$

- i) If $DF = x \text{ cm}, EF = y \text{ cm}$ and $BC = c \text{ cm}$ show that $a^2 = 4x^2 + 4y^2$.
 ii) Hence or otherwise find the exact length of BC .

1
4

Question 4 (15 marks) Start a new page:

- a) Use the trapezoidal rule with 3 function values to estimate the value of $\int_0^1 x \tan x dx$ to 3 significant figures.
- b) John knows that he will receive \$15 000 inheritance on his 21st birthday which is on 30 March 2008. As he needs a car now, he borrows \$30 000 on 1 April, 2004 at a reducible interest rate of 9% pa, to be repaid in equal monthly instalments of \$M.
- i) Write an expression for the amount owing A_1 , after 1 month when the first repayment has been made.
- ii) Write an expression, in terms of M , for the amount owing on 30 March 2008, prior to this month's repayment being made.
- iii) Calculate the minimum equal repayment that John must pay each month so that he is able to pay off the loan completely with only the \$15 000 on 30 March 2008.

3
1
2
3

	Marks
Question 4 (continued)	
c) The diagram shows the design of a clay pot which is formed by rotating the shaded area one revolution about the y axis.	
i) Write an expression for the volume of the clay required to make the pot.	2
ii) Hence or otherwise calculate the volume of clay.	4

END OF EXAMINATION