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0606/22

October/November 2012

2 hours

Additional Materials: Electronic calculator

READ THESE INSTRUCTIONS FIRST

Do not use staples, paper clips, highlighters, glue or correction fluid.

You are reminded of the need for clear presentation in your answers.

The total number of marks for this paper is 80.

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This document consists of **16** printed pages.

Mathematical Formulae**1. ALGEBRA***Quadratic Equation*

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

2. TRIGONOMETRY*Identities*

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

- 1 Solve the equation $|7x + 5| = |3x - 13|$.

[4]

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-
- 2 The total surface area, $A \text{ cm}^2$, of a solid cylinder with radius $r \text{ cm}$ and height 5 cm is given by $A = 2\pi r^2 + 10\pi r$. Given that r is increasing at a rate of $\frac{0.2}{\pi} \text{ cm s}^{-1}$, find the rate of increase of A when r is 6. [4]

3 Solve the inequality $4x(4 - x) > 7$.

[4]

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- 4 (i) Find the coefficient of x^5 in the expansion of $(2 - x)^8$.

[2]

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- (ii) Find the coefficient of x^5 in the expansion of $(1 + 2x)(2 - x)^8$.

[3]

- 5 A 4-digit number is formed by using four of the six digits 2, 3, 4, 5, 6 and 8; no digit may be used more than once in any number. How many different 4-digit numbers can be formed if

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(i) there are no restrictions, [2]

(ii) the number is even and more than 6000? [3]

- 6 (i) Given that $\frac{2^{x-3}}{8^{2y-3}} = 16^{x-y}$, show that $3x + 2y = 6$.

[2]

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- (ii) Given also that $\frac{5^y}{125^{x-2}} = 25$, find the value of x and of y .

[4]

7 (i) Find $\frac{d}{dx}(\tan 4x)$.

[2]

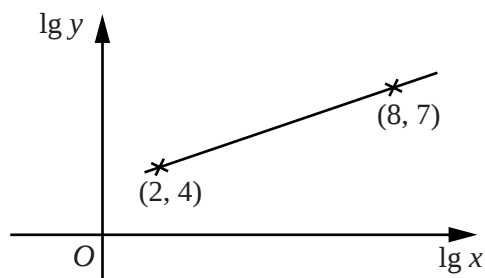
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(ii) Hence find $\int (1 + \sec^2 4x) dx$.

[3]

(iii) Hence show that $\int_{-\frac{\pi}{16}}^{\frac{\pi}{16}} (1 + \sec^2 4x) dx = k(\pi+4)$, where k is a constant to be found.

[2]



The variables x and y are related in such a way that when $\lg y$ is plotted against $\lg x$ a straight line graph is obtained as shown in the diagram. The line passes through the points $(2, 4)$ and $(8, 7)$.

- (i) Express y in terms of x , giving your answer in the form $y = ax^b$, where a and b are constants. [5]

Another method of drawing a straight line graph for the relationship $y = ax^b$, found in part (i), involves plotting $\lg x$ on the horizontal axis and $\lg(y^2)$ on the vertical axis. For this straight line graph what is

- (ii) the gradient, [1]

- (iii) the intercept on the vertical axis? [1]

- 9 A plane, whose speed in still air is 420 km h^{-1} , travels directly from A to B , a distance of 1000 km . The bearing of B from A is 230° and there is a wind of 80 km h^{-1} from the east.

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- (i) Find the bearing on which the plane was steered.

[4]

- (ii) Find the time taken for the journey.

[4]

- 10** The acceleration, $a \text{ m s}^{-2}$, of a particle, $t \text{ s}$ after passing through a fixed point O , is given by $a = 4 - 2t$, for $t > 0$. The particle, which moves in a straight line, passes through O with a velocity of 12 m s^{-1} .

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- (i)** Find the value of t when the particle comes to instantaneous rest. [5]

- (ii)** Find the distance from O of the particle when it comes to instantaneous rest. [3]

11 (a) Solve $4\sin x + 9\cos x = 0$ for $0^\circ < x < 360^\circ$.

[3]

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(b) Solve $\operatorname{cosec} y - 1 = 12 \sin y$ for $0^\circ < y < 360^\circ$.

[5]

(c) Solve $3\sec\left(\frac{z}{3}\right) = 5$ for $0 < z < 6\pi$ radians.

[4]

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Answer only **one** of the following alternatives.

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EITHER

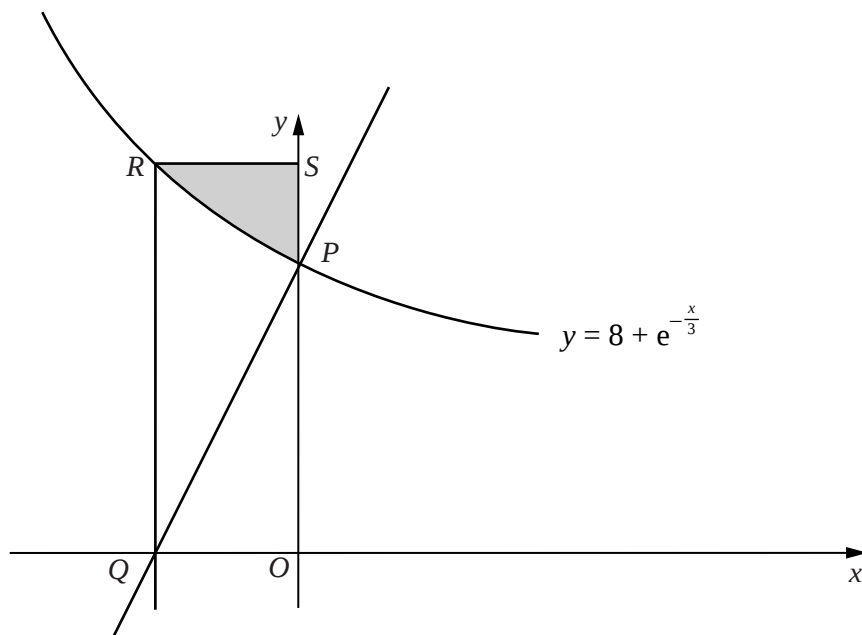
- 12** The point $A(0, 10)$ lies on the curve for which $\frac{dy}{dx} = e^{-\frac{x}{4}}$. The point B , with x -coordinate -4 , also lies on the curve.

- (i) Find, in terms of e , the y -coordinate of B . [5]

The tangents to the curve at the points A and B intersect at the point C .

- (ii) Find, in terms of e , the x -coordinate of the point C . [5]

OR



The diagram shows part of the curve $y = 8 + e^{-\frac{x}{3}}$ crossing the y -axis at P . The normal to the curve at P meets the x -axis at Q .

- (i) Find the coordinates of Q . [4]

The line through Q , parallel to the y -axis, meets the curve at R and $OQRS$ is a rectangle.

- (ii) Find $\int \left(8 + e^{-\frac{x}{3}}\right) dx$ and hence find the area of the shaded region. [6]

Indicate which question you are answering.

EITHER	
OR	

[illegible]

Continue your answer here if necessary.

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