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Core Mathematics C2

Advanced Subsidiary

Practice Paper 1

Time: 1 hour 30 minutes

(1) $g(x) = px^3 - 2qx^2 + 4$

(a) When $g(x)$ is divided by $(x+1)$ the remainder is 2. Write down a linear relation between p and q. *(3 marks)*
(b) Given $g(2) = -28$ find the values of p and q. *(4 marks)*

(2) (a) State the two transformations that map the graph of $y = \cos(x)$ *to* $y = \cos(x-30)+1$ *(2 marks)*
(b) Solve the equation $2 = \cos(x-30)+1$ for $-360 < x < 180$ *(4 marks)*

(3) (a) Sketch the graph of $y = x^3 - x^2 - 6x$ showing any points of intersection with coordinate axis. *(3 marks)*
(b) Show the area trapped between the curve and the x axis to the left of the axis y is $\frac{16}{3}$. *(5 marks)*

(4) Fred is playing a computer game. The strength he has in each round is such that in round 1 he has a strength of 3 units, in round 2 he has a strength of 6 units, in round 3 he has a strength of 12 units and so on such that his strength in each level forms a geometric series.

(a) Find his strength in the 8th round. *(2 marks)*
(b) Find the number of rounds completed before his strength exceeds 8000 units. *(4 marks)*

(5) A circle has equation $x^2 + y^2 - 8x - 6y - 25 = 0$

(a) Find the centre of the circle. *(3 marks)*
(b) Find the length of the radius giving your answer in the form $p\sqrt{q}$ *(3 marks)*
(c) Show that the point $R(10,7)$ lies outside the circle. *(3 marks)*
(d)Find the equation of the tangent to the circle at the point $S(11,4)$ *(5 marks)*

(6) Company X is designing a mini rollercoaster. The path of the roller coaster is modelled by the equation $h = 18t - 2t^2$ where h is the height above ground level and t the time in seconds after the ride has started. The model is valid for $0 \le t \le 12$

(a) Find the time taken for the rollercoaster to return to ground level once in the ride has started. *(2 marks)*
(b) Find the maximum height of the rollercoaster above the ground and justify it's a maximum. *(5 marks)*

(7) (a) Show that the equation $\tan(x) = 2\sin(x)$ can be written as $(1 - 2\cos x)\sin(x) = 0$ *(3 marks)*
(b) Hence solve the equation $\tan(x) = 2\sin(x)$ for $0 \le x \le 2\pi$ giving your answers in terms of π *(4 marks)*

(8) $f'(x) = 3x^2 - \frac{2}{\sqrt{x}} + 4$ Given the point $(4,0)$ lies on $f(x)$ find an equation for $f(x)$ *(7 marks)*

(9) (a) Solve the equation $2^{1-3x} = 17$ giving your answer to 3 significant figures. *(3 marks)*
(b) Given $\log_3 p = a$ and $\log_3 q = b$ simplify $\log_3 27p^2q^3$ giving your answer in terms of a and b. *(5 marks)*

(10) Find the x coordinate of the stationary point of the curve with equation $m = x\left(\sqrt{x} - 12\right)$ giving your answer in the form 2^n where n is an integer to be found and determine the nature of the stationary point. *(5 marks)*

End of Questions