fA-Level Maths — Exam Revision Notes Questions · Marks

@milo thank you for your help np

Question	Marks	Answer / Key Steps
Q1 — Translation of Co-ordinates P(−4, 5) a) 4f(2x) b) f(x+3) − 2	4	a) (−2, 20) → 2 marks b) (−7, 3) → 2 marks
Q2 — Approximation / Root Finding $f(x) = c \cdot x^3 + 3x - 2$ A) Show root lies in [1.1, 1.2] B) Find x_2 Bi) Find A	a)2 bi)1 bii)2 Total 5	A) f(1.1) and f(1.2) change sign → continuous → root in interval B) x_2 =1.158(apply Newton–Raphson or iteration) Bi) a =1.138 (value from iteration)

Q3 — Differentiation f(x) = (given function) Find dy/dx, then use coordinate (2, 3)	5d	dy/dx = (differentiated expression) Tangent: y = 9x − 15
Q4 — Functions g(x) = (5x − 1)/(x − 4) f(x)=3x^2 -2 a) Minimum point of f(x) b) Find gf(x) when x=2? c) Find $g^{-1}(x)$	**5**	a) f≥ −2 b) 49/6 c) $g^{-1}(x) = (4x − 1)/(x − 5)$
Q5 — Helicopter Parametric $x = 100\sqrt{t}$, $y = 10 \sin(t^2/4)$ a) Maximum vertical height b) Horizontal distance at max height of 5 m	**5** -someone said 6	a) 10 m b) 180 m
Q6 — Integration $\int_2^p [3 / (7x + 1)]\, dx = 6/7$, p > 2	**5**	$P = (15e^2 − 1) / 7$

Q7 — Area of Semicircle Segment $R_1 = 2R_2$ (given) a) Show: $p \cdot \sin\theta + q \cdot \theta - 2\pi = 0$ b) 1st approx $\alpha = 1.3$; find 2nd approx via Newton–Raphson	**7**	a) $p = 1$, $q = 3 \rightarrow \sin\theta + 3\theta - 2\pi = 0$ Area of segment: $A = \frac{1}{2}r^2(\theta - \sin\theta)$ $R_1 = 2R_2$ leads to $\theta - \sin\theta = 2(\pi - \theta) - 2\sin(\pi - \theta)$ $\sin(\pi - \theta) = \sin\theta \rightarrow$ simplifies to $3\theta + \sin\theta - 2\pi = 0$ ✓ b) $f(a) = 3a + \sin(a) - 2\pi$ $f'(a) = 3 + \cos(a)$ Apply NR: $a_{n+1} = a_n - f(a_n)/f'(a_n)$
Q8 — Integration (Area) x-coord of P = 2 (given)	**5** Someone said 6	Answer: $5/4 \cdot e^6 + \frac{1}{4}$
Q9 — Trig Identity $(\sin\theta + \cos\theta)(\operatorname{cosec}\theta - \sec\theta) = k \cdot \cot 2\theta$ a) Find k b) Solve $(\sin x + \cos x)(\csc x - \sec x) = 4\csc^2(2x)$	**a)3 or 4?** **b)5** 2 people said total 8	a) $k = 2$ $\operatorname{cosec}\theta - \sec\theta = (\cos\theta - \sin\theta)/(\sin\theta \cos\theta)$ $= 2(\cos\theta - \sin\theta)/\sin 2\theta$

for $-90° < x < 90°$		Full product = $2\cos 2\theta / \sin 2\theta = 2\cot 2\theta$ ✓ b) Note: equation reduces to $\sin 4x = 4$ (no solution) Likely intended: $2\csc^2(2x)$ → check original paper
Q10 — Modulus Graph a) Draw modulus graph b) Find range of k using $y = k/x$	**7**	Intercept = q, vertex = q/p k/x intersects negative-gradient region twice: $0 < k < q^2/(4p)$
Q11 — Curve & Area y_C = $7x / \sqrt{(3x^2 + 4)}$ a) Equation of line L: $ax + by + c = 0$ b) y-coord of point Q c) Area of bounded region R	**10**	a) $14y + 32x - 133 = 0$ (intercept 113/14) c) $\int_0^2 (-16x/7 + 113/14 - 7x/\sqrt{(3x^2+4)})\,dx = 145/21$

Q12 — Harmonic Form a) 4cosx − 13sinx = R·cos(x + α) b) D = 30 + 4cos(πt/12 + 0.2) − 13sin(πt/12 + 0.2) bi) Find minimum value of D bii) Find time T at minimum c) Why can't this model be used year-round?	**a:3** **b:1** **c:4** **d:1** Someone said 7	a) R = √185, α = 1.272 bi) Minimum D = 30 − √185 ≈ 16.4 (stated as ~2.7 in notes) bii) t ≈ 6:23 c) Model is periodic / doesn't account for seasonal variation
Q13 — Geometric Series $u_3 = \sin\theta$, $u_4 = \sqrt{2}\cdot\cos\theta$, $u_5 = \sqrt{3}\cdot\cot\theta$ a) Find common ratio r (exact) b) Find sum of terms 1, 2 and 3	**7** **a)4** **b)3**	a) θ = π/6, r = √6 b) u□ = (1/12)(√6)$^{n-1}$ S = $u_1 + u_2 + u_3$ = 1/12(1 + √6 + 6) = (7 + √6)/12
Q14 — Differential Equation dx/dt = x(A − t) a) Solve (exact value) b) Find maximum value of x	**11 (4+3+3 approx)**	a) x = 0.3·e^(2t + t/4·ln70 − t²/2) b) x_max ≈ 32.6 when t = A c) T ≈ 6.46

c) Find time T when x returns to start		
Q15 — Proof by Contradiction Given $a^2 + b^2 = c^2$ Prove a and b cannot both be odd	**4**	Let a = 2m+1, b = 2n+1 (both odd) $a^2 + b^2 = 4m^2+4m+1 + 4n^2+4n+1 = 4m^2+4m+4n^2+4n+2 = 4(m^2+m+n^2+n) + 2$ → even but $\not\equiv 0 \pmod 4$ So $c^2 \equiv 2 \pmod 4$. But squares are 0 or 1 (mod 4). Contradiction → a and b cannot both be odd ✓

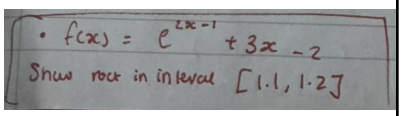
currently total marks ≈**97**? Don't know exactly how many marks each question and part is worth

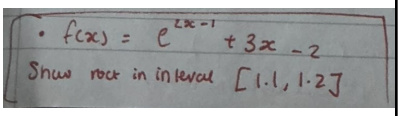
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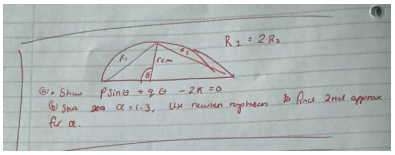
Can i delete everything below???? We have it all fixed above, besides images

Google docs doesnt have collapsable headers gng i dont see why we still want the bit below

question	marks	answer
1 Translation of co-ordinates P(-4,5) a) 4f(2x) b) f(x+3) - 2	4	(-2,20) → 2 marks (-7,3) → 2 marks
 2 Approximation		f(1.1) f(1.2) change in sign continuous x2= a=

 A)Show root lies in 1.1-1.2 B)FIND X2 Bi) FIND A		
3 differentiation question f(x)= dy/dx= coordinate(2, 3) Y = 9x-15	5	
4 Function f(x) = g(x) = a) b) c) find g^-1(x)	5	a)F>-2 b) 49/6 C)Y=(4x-1)/x-5
5 Helicopter parametric X = 100√ t y = 10sin(t^2/4) a) Maximum vertical height b) Horizontal distance at a	5x	a) 10m b)180m

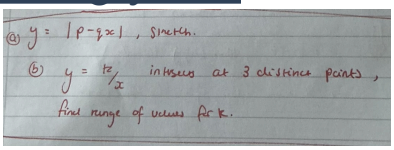
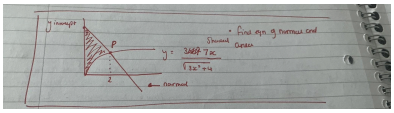
maximum height of 5m		
6 ∫ p ∫ from 2 to p [3/(7x + 1)] dx = 2 = 6/7 (haha edexcel's a comedian) p>2	5	P = (15e^2 - 1)/7

7 Area of semicircle segment $R_1 = 2R_2$ (given) a “Show psinθ + qθ - 2π = 0 b “1st approximation for α = 1.3. Use newton raphson method to find 2nd approximation for α “  	7	a) 1sinθ + 3θ - 2π = 0 Aka p = 1 , q = 3 To solve, use areausearea of segment A = $(\theta-\sin\theta)r^2/2$ $R_1 = (\theta-\sin\theta)r^2/2 = 2R_2$ $R_2 = (\pi - \theta - \sin(\pi - \theta))r^2/2$ Therefore $(\theta-\sin\theta)r^2/2 = 2(\pi - \theta - \sin(\pi - \theta))r^2/2$ This simplifies to $(\theta-\sin\theta) = 2\pi - 2\theta - 2\sin(\pi - \theta)$ $\sin(-\theta + \pi) = \sin(\theta)$ Therefore $\theta-\sin\theta = 2\pi - 2\theta - 2\sin\theta$ Rearrange to 3θ

		+ sinθ - 2π = 0 b) For Newton Raphson, f(x) = 0 Since 3a + sin(a) - 2π = 0 We can say: f(a) = 3a + sin(a) - 2π f'(a) = 3+cos(a) Apply NR method to
8 Integration x of P = 2 (given) Wrong q thats q 11 aight	5	5/4 (e^6) + ¼
9 Trig equation (sinθ+cosθ)(cose		k=2

cθ-secθ)=kcot2θ 2nd Part of Question: (sinx + cosx)(cscx - secx) = 4csc^2 (2x) For this u made 4cosec^2^(2x)=2cot(2x) then make the coesec^2(2x) cot^2x from the identity sin^2 + cos^2=1 by dividing by sin^2 Make it 4(cot^2(2x) +1) = 2cot(2x) ^^ I think this function is wrong, because it gives the result sin4x = 4 Might have been 2csc squared then The values in the		Cscθ = 1/sinθ Secθ = 1/cosθ Multiply top and bottom, so the left bracket = ((cosθ - sinθ)/(sinθcosθ)) = 2(cosθ - sinθ)/(2sinθcosθ) = 2(cosθ - sinθ)/(sin2θ) Therefore total equation is: ((cosθ + sinθ) × 2(cosθ - sinθ)) / (sin2θ) = 2(cos^{2}θ - sin^{2}θ) / (sin2θ) = 2(cos2θ) / (sin2θ) = 2 cot2θ

student room ai markscheme is what i got $-90^{o} < x < 90^{o}$ Solve for x		Therefore k = 2 [error somewhere] Second part of the Question: $(\sin x + \cos x)(\csc x - \sec x) = 4\csc^2 2x$ [given] $(\sin x + \cos x)(\csc x - \sec x) = 2\cot 2x$ [substitution from part a] Therefore, $4\csc^2 2x = 2\cot 2x$ $\csc^2 2x = 1/\sin^2 2x$ $\cot 2x = \cos 2x/\sin 2x$ Therefore

		4 = $2\sin^2(2x)\cos(2x)/\sin 2x$ 4 = $2\sin(2x)\cos(2x)$ 4 = sin4x ??
10 (a) Drawing modulus graph (b) range of k using y=k/x 	7	a) Intercept is q. Vertex is q/p b) Pretty sure k/x intersects the negative gradient area twice → $0<k<q^2/4p$
11  $y_C = 7x / \text{root}(3x^2 + 4)$ a) find equation of line L in form ax + by + c = 0	10	14y-32x-113 Was it not 14y+32x-133=0 Intercept 113/14 $\int_0^2 (-16x/7 + 113/14 - 7x/\sqrt{(3x^2 + 4)})\,dx = 145/21$ (6.904…) was the answer not

b) find y co-ordinate of point Q b) find area of bounded region R		
12) Harmonic Form a) 4cosx - 13sinx = Rcos(x+a) b) D = 30 + 4cos(πt/12 + 0.2) - 13sin(πt/12 + 0.2) bi) find MINIMUM bii) find time T @ minimum	6? How many marks was this Part a, 3 marks B,1 C, 4 D,1 Was c just dy/dx=0 i forgot wha I equated it to -1 so i got shook when u said dy/dx	A)R = root(185) a= 1.272 B)30GW it asked for the max/min no?B)6:23 It was 6:23 C)2.7
13 Geometric series u_3 = sinθ u_4 = √root2 cosθ u_5 = √root3 cotθ	7 6? 3 and 3	a=pi/6 R = sqrt 6 7+root6 over 3 It's over 12 for sure not over 3 I got over 12

a) find the common ratio (r) exact value. b) find the sum of term 1, 2, and 3		Where did 7 come from??? $u_3 = ar^2$ $u_4 = ar^3$ u_5 ar^4 Solution to part a) ar2 = sinθ ar3 = √2 cosθ ar4 = root3 cotθ ar3 = rsinθ = root2 cosθ Ar4 = r root2 cosθ = root3 cotθ r = root(6) Solution to part b)
14. Differential equation a) dx/dt = x(A-t)	11	A x = 0.3e^(2t+t/4 ln70 - t^2/2) B max is like 32.6 when t = A = 32.600522346

		C T = 6.46
15 Proof Given $a^2 + b^2 = c^2$ Prove that both a and b can't be odd (or smth like that) Let a = 2m + 1 Let b = 2n +1	4	Person 1's Answer: Expand out a^2 and b^2 using 2m+1 and 2n+1 and sum. This gives you 4m^2 + 4m + 4n^2 + 4n + 2 = c^2. c^2 is even, therefore c is even, therefore c = 2p where p is an integer. Therefore c^2 = 4p^2. Factor out 2 on both sides, you get 2m^2 + 2m + 2n^2 + 2n + 1 = 2p^2. Therefore even = odd, therefore contradiction. Person 2's

		Answer: Expand out a^2 and b^2 using 2m+1 and 2n+1 and sum. Root this answer. Take out factor of root two. Show inside other root is always odd so can never equal any multiple of root two therefore c is always irrational.

① $P(-4,5)$ is on $f(x)$, find co-ords for: $y=4f(2x)$

b. $y=f(x+3)-2$

③ $C: y=x^3-2x^2+5x-7$

find equation of tangent to C where $x=2$

④ $f(x)=3x^2-2$

$g(x)=\frac{5x-1}{x-4}$

a. What's range of g

b. find $gf(2)$

c. find $g^{-1}(x)$

⑪ a. $4\cos x-13\sin x$ in form $R\cos(x+\alpha)$, find R & α in rad. to 3dp.

b. $D=30+4\cos\left(\frac{\pi t}{12}+0.2\right)-13\sin\left(\frac{\pi t}{12}+0.2\right)$ $0\le t\le 24$. i. find D_{min} ii. find t when D_{min}.

c. at $t=15$, rate of increase is k, find k.

⑫ $y=\frac{k}{x}$ intersects $y=|px-q|$, find at 3 points, find range of values of k

⑬ geometric seq. 3rd, 4th & 5th term: $\sin\theta, \sqrt{2}\cos\theta, \sqrt{3}\cot\theta$. a. find common ratio exact value. b. find first 3 terms exact value.

⑭ $\frac{dx}{dt}=x(A-t)$, $t\ge 0$

$x_0=0.3$, $x=21$ when $t=4$

a. find solution of $\frac{dx}{dt}$ in form $x=f(t)$

b. find x_{max} to 3 d.p.

c. $x=0.1$ when $t=T$, find T to 3 d.p.

⑮ It is given that

$a^2+b^2=c^2$, $a\in\mathbb{N}$, $b\in\mathbb{N}$.

Show that a and b cannot both be odd.

⑤ $C: x=100\sqrt{E}$, $y=10\sin\left(\frac{t^2}{4}\right)$, $t\ge 0$

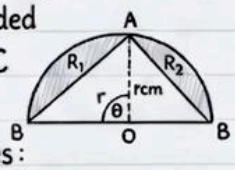
a. what's x_{max}

b. find A when $x=5$ for the 2nd time

⑥ a. find $\int\frac{3}{7x+1}dx$

b. $\int_2^p\frac{3}{7x+1}dx=\frac{6}{7}$, find p

⑦ OABCO semicircle, radius r, centre O, R_1 area bounded by arc & chord BC, R_2 area bounded by arc & chord AC is twice R_2 area.



a. show θ satisfies: $p\sin\theta+q\theta-2\pi=0$

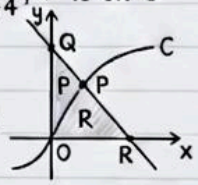
b. first approx. for $\theta=1.3$, use Newton-Raphson for second approx. 3 d.p.

⑧ Show: $\lim_{\delta x\to 0}\sum_{x=0}^{3}xe^{2x}\delta x=Ae^6+B$

⑨ a. show: $(\cos\theta+\sin\theta)(\operatorname{cosec}\theta-\sec\theta)=k\cot 2\theta$

b. solve: $5(\cos x+\sin x)(\operatorname{cosec}x-\sec x)=4\operatorname{cosec}^2 2x$, $-90°<x<90°$

⑩ Curve C: $y=\frac{7x}{\sqrt{3x^3+4}}$, P is on C & has x coord 2, line L is normal to C at P. y-intercept of L is R.



a. find L equation in $ax+by+c=0$ form.

b. find y co-ord of Q.

c. find area R, bounded by C, L & x-axis.

wait for 10c was it the area between the line/curve and y axis or with the x axis?