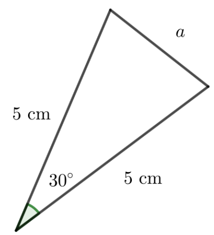
AQA Level 2 Further Mathematics Warmup - Paper 2 2023

Write $\sqrt{75}+3\sqrt{108}-2\sqrt{12}$ in the form $a\sqrt{3}$	What is the matrix representing an enlargement, scale factor 4 centre the origin?	Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ for $y=\frac{(x+3)(x+1)}{x}$	Expand and simplify $(z^2+2z-3)(2z+3)-2(z+1)(z^3-1)$	Solve $xy=10$ and $x+y=7$ simultaneously.
Define the piecewise linear function shown below 	Write down the equation of the circle with centre $(3,4)$ and radius 6.	Sketch $y=\cos(x)$ and $y=\sin(x)$ for $0^\circ \leq x \leq 720^\circ$	Find $f^{-1}(x)$ for $f(x)=\frac{4}{2x+3}$	Prove that $(n+2)^2-(n-2)^2$ is divisible by 8 for all $n\in\mathbb{N}$.
	When is the function $y=x^2-x-6$ increasing?	How many odd four digit numbers can you make with the digits 2,3,4,5 with no repetition?	Find the equation of the tangent to the circle $(x-3)^2+(y+2)^2=25$ at the point $(6,2)$	For the triangle shown below find: **a)** The side length a. **b)** The area of the triangle
Find the equation of the straight line through $(4,5)$ and $(2,9)$	Write down the limiting value of the sequence $\frac{3n}{2n+5}$ as $n\to\infty$	Factorise $9x^4y^2-25$	Show that $(x+4)$ is a factor of $p(x)=x^3+3x^2-6x-8$	
Prove $\tan(x)\sin(x)+\cos(x)=\frac{1}{\cos(x)}$	Factorise fully $3(x+5)^4-2(x+5)^3$	Find the rate of change of y with respect to x for $y=3x^2+4x$ when $x=2$	Fully factorise the polynomial above.	Find the nth term of the sequence 1, 5, 13, 25

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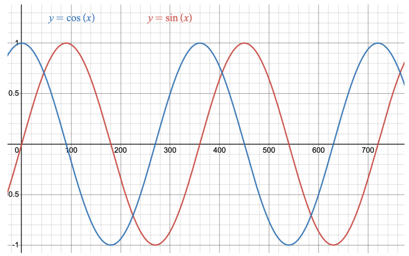
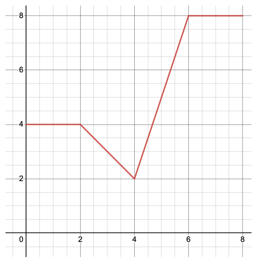
$= \sqrt{75} + 3\sqrt{108} - 2\sqrt{12}$ $= \sqrt{25 \times 3} + 3\sqrt{36 \times 3} - 2\sqrt{4 \times 3}$ $= 5\sqrt{3} + 18\sqrt{3} - 4\sqrt{3}$ $= 19\sqrt{3}$	$\begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}$	$y = \dfrac{x^2 + 4x + 3}{x}$ $= x + 4 + 3x^{-1}$ So $\dfrac{dy}{dx} = 1 - \dfrac{3}{x^2}$	$-2z^4 + 7z^2 + 2z - 7$	$x = 2, y = 5$
$f(x) = 4, \quad 0 \le x < 2$ $= -x + 6, \quad 2 \le x < 4$ $= 3x + 10, \quad 4 \le x < 6$ $= 8, \quad 6 \le x < 8$	$(x-3)^2 + (y-4)^2 = 36$		$f^{-1}(x) = \dfrac{4 - 3x}{2x}$	$(n+2)^2 - (n-2)^2 = n^2 + 4n + 4 - (n^2 - 4n + 4)$ $= 8n$ which is divisible by 8.
	Increasing when $x > \dfrac{1}{2}$	12	$3x + 4y = 26$	**a)** Using the cosine rule $a^2 = 5^2 + 5^2 - 2 \times 5 \times 5 \times \cos(30)$ $= 50 - 50\cos(30)$ $= 6.6898729$ So $a \approx 2.588$
$y = -2x + 13$	$\dfrac{3}{2}$	$(3x^2y - 5)(3x^2y + 5)$	$p(-4) = (-4)^3 + 3 \times (-4)^2 - 6 \times -4 - 8$ $= 0$ Hence, $(x+4)$ is a factor of $p(x)$	**b)** Using the area formula $A = \dfrac{1}{2} \times 5 \times 5 \times \sin(30)$ $= \dfrac{25}{4}$
$LHS = \tan(x)\sin(x) + \cos(x)$ $= \dfrac{\sin(x)}{\cos(x)}\sin(x) + \cos(x)$ $= \dfrac{\sin^2(x) + \cos^2 x}{\cos(x)}$ $= \dfrac{1}{\cos(x)}$	$= (x+5)^3\big(3(x+5) - 2\big)$ $= (x+5)^3(3x+13)$	$\dfrac{dy}{dx} = 6x + 4$ When $x = 2$ $\dfrac{dy}{dx} = 16$	$p(x) = (x+4)(x-2)(x+1)$	$u(n) = 2n^2 - 2n + 1$