AQA A-Level Mathematics Warmup - Paper 1 2024

Write down the double angle formulae.	Where does the line parallel to $2x + 6y = 4$ passing through $(3,2)$ cross the axes.	Differentiate $y = \tan(3x^2 + 4x)$	Rationalise the denominator $\dfrac{2+\sqrt{5}}{4+3\sqrt{5}}$	Find $\int_0^{\frac{3\pi}{2}} x\sin(x)\ \mathrm{d}x$
Sketch on the same axes the following: $y = \tan(x)$ $y = \tan(x) - \dfrac{\pi}{2}$	What is the equation of a circle with centre $(-1,4)$ and radius 5?	Find $\int x\sqrt{x+4}\ \mathrm{d}x$	Sketch $y = (x-2)(x+3)(x+1)$ and its gradient function.	For the relationship $y = ab^x$ find the linearised form.
Find the equation of the tangent to $y = \sin(x)$ at $x = \dfrac{\pi}{6}$	$(x+4)$ is a factor of $p(x) = x^3 - x^2 + ax + 24$ Find the value of a and full factorise $p(x)$.	Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ for $4x^2 + 2xy + 3y^2 = 2 + x^3$	Show that the equation $\mathrm{e}^x - 4 + \sin(x) = 0$ has a root between $x = 0$ and $x = 2$	Find the area and arc length for a sector of a circle with radius 5 cm and subtended angle $60°$.
Find $\int \ln(x)\ \mathrm{d}x$	Sketch the quadratic $y = x^2 - x - 6$ showing the coordinates of all turning points.	Differentiate $y = \cos(x)$ from first principles.	An arithmetic series has 4th term 24 and 12th term 64. Find the first term a and common difference d. Find the sum of the first 15 terms.	Find the distance between the points $A(1,6)$ and $B(-3,18)$. Find also the midpoint.

AQA A-Level Mathematics Warmup - Paper 1 2024

$\sin(2x) = 2\sin(x)\cos(x)$

$\cos(2x) = \cos^2(x) - \sin^2(x)$
$= 2\cos^2(x) - 1$
$= 2\sin^2(x) - 1$

$\tan(2x) = \dfrac{2\tan(x)}{1 - \tan^2(x)}$

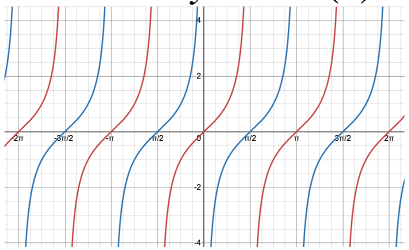
Parallel line has equation
$x + 3y = 9$
$y-$intercept $= (0,3)$
$x-$intercept $= (9,0)$

$\dfrac{dy}{dx} = (6x + 4)\sec^2(3x^2 + 4x)$

$\dfrac{7}{29} + \dfrac{2\sqrt{5}}{29}$

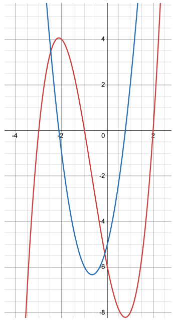
$\int x\sin(x)\ dx = \sin(x) - x\cos(x) + C$
using integration by parts.
So, $\int_0^{\frac{3\pi}{2}} x\sin(x)\ dx = -1$

Red line: $y = \tan(x)$



$(x + 1)^2 + (y - 4)^2 = 25$

$\dfrac{2}{15}(x + 4)^{\frac{3}{2}}(3x - 8)$



$y = ab^x$
$\Rightarrow \ln(y) = \ln(ab^x)$
$= \ln(a) + \ln(b^x)$
$= \ln(a) + x\ln(b)$

$y = \dfrac{\sqrt{3}}{2}x - \dfrac{\pi}{4\sqrt{3}} + \dfrac{1}{2}$

$a = -14$
$p(x) = (x + 4)(x - 2)(x - 3)$

$\dfrac{dy}{dx} = \dfrac{3x^2 - 8x - 2y}{2x + 6y}$

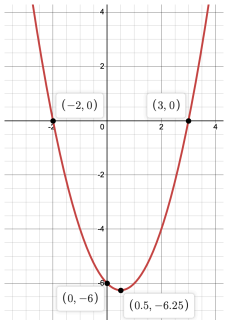
Let $f(x) = e^x - 4 + \sin(x)$, then $f(0) = -3$ and $f(2) \approx 4.298$ so there is a sign change and $f(x)$ is continuos. Hence a root in the interval $(0,2)$

$60° = \dfrac{\pi}{3}$ radians.

Arc length $= 5 \times \dfrac{\pi}{3} = \dfrac{5\pi}{3}$

Area
$= \dfrac{1}{2} \times 5^2 \times \dfrac{\pi}{3} = \dfrac{25\pi}{6}$

$\int \ln(x)\ dx = x\ln(x) - x + C$



$f'(x) = \lim_{h\to 0} \dfrac{f(x+h) - f(x)}{h}$
$= lim_{h\to 0} \dfrac{sin(x+h) - sin(x)}{h}$
$= \lim_{h\to 0} \dfrac{\sin(x)\cos(h) + \cos(x)\sin(h) - \sin(x)}{h}$
$= lim_{h\to 0} \dfrac{\sin(x)\left(1 - \frac{h^2}{2}\right) + \cos(x)h - \sin(x)}{h}$
$= \lim_{h\to\infty} \dfrac{h}{2}\sin(x) + \cos(x)$ $= \cos(x)$

$a = 9$
$d = 5$
So,
$S_{15} = \dfrac{15}{2}\left[2 \times 9 + (15 - 1) \times 5\right]$
$= 660$

Distance
$= \sqrt{(1 - -3)^2 + (6 - 18)^2} = \sqrt{160} = 4\sqrt{10}$

Midpoint
$= \left(\dfrac{1 + -3}{2}, \dfrac{6 + 18}{2}\right) = (-1, 12)$