

Math SL PROBLEM SET 59

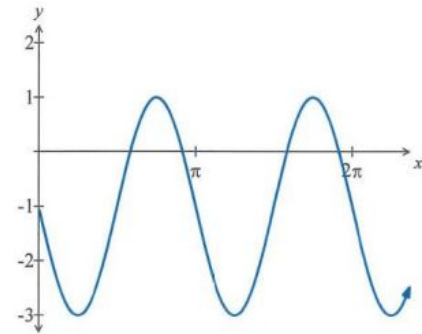
Section A (Skills/Concepts Consolidation)

- (CI)** Find the equation of the line that is tangent to $g(x) = \ln(3 + x^2)$ at the point where $x = 1$.
- (CA)** Let $h(x) = \frac{x^2 + x - 5}{x + 3}$, $x \neq -3$.
 - Find the slope of $h(x)$ at the point where $x = \frac{-5}{2}$.
 - Solve the equation $h'(x) = 0$ and hence or otherwise, determine when $h'(x) > 0$.
- (CI)** Let $f(x) = \sqrt{\frac{1}{x^2} - 1}$. Find:
 - The set of real values for x for which f is real and finite.
 - The range of f .
 - The equation of the inverse of $f(x)$.
 - Find the equation of the derivative of f .
- (CI)** Given the function $f(x) = \frac{1}{2} \sin(2x) + \cos(x)$ on the domain of $0 \leq x \leq 2\pi$, determine:
 - the x -coordinates of the zeroes
 - the exact coordinates of any maximum and/or minimum points.
- (CI)** The line $3x - 2y - 5 = 0$ is tangent to the curve $y = 4x^3 + ax^2 - \frac{5}{2}x + b$ at the point $(1, -1)$. Find the values of a and b .
- (CI)** Solve for x in each equation. Express any answer(s) **exactly**.
 - $\log_2(x - 5) + \log_2(x + 2) = 5$
 - $x = \sqrt{x + 5} - 3$
 - $2^{x+1} = 3^{2-x}$
- (CA)** A geometric sequence has all positive terms. The sum of the first two terms is 15 and the sum to infinity is 27. Find the sum of the first 12 terms.

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8. **(CA)** Find any possible length(s) of side AC in triangle ABC given that angle A is 42° , side AB is 12.7 cm and side BC is 10.2 cm.
9. **(CI)** Find the range of values for a for which the equation $(2 - 3a)x^2 + (4 - a)x + 2 = 0$ has no real roots.
10. **(CI)** The three terms $a, 1, b$ are in arithmetic progression. The three terms $1, a, b$ are in geometric progression. Find the value of a and of b , given that $a \neq b$.

11. **(CI)** The graph of the function $g(x) = a \sin (bx) + c$, where a, b and c are integers, is sketched.



- Determine the values of a, b and c .
 - Determine the values of $g(\pi)$ and $g'(\pi)$ and $g''(\pi)$.
12. **(CI)** The temperature over a 24 hour period in Paris is modelled by the trigonometric function $C(t) = 17 - 6 \cos\left(\frac{\pi}{12}t\right)$, where C is the temperature in degree Celsius and t is time in hours after midnight.
- What is the approximate temperature at 10:00 am?
 - What is the minimum temperature and when does it occur?
 - What is the maximum temperature and when does it occur?
 - At 18:00 (6 pm), the temperature given by the function is 17°C . What other time during the day does the trig function give the same temperature?
 - At what time(s) of the day is the temperature 14°C ?
13. **(CA)** Vector L_1 goes through the points $A(-2,0,4)$ and $B(4,3,-1)$.
- Determine an equation for L_1 . Write the equation in all 3 forms.
 - Verify that the point $C(-8,-3,9)$ is on L_1 .
 - How far is C from the origin?
 - D is another point on the vector. Write an expression for the distance from D to the origin.
 - Hence or otherwise, find the location of D such that its distance from the origin is minimized.