

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 3 (Trig Equations 3)

Without using a calculator :

Task 1

- 1 Functions f and g are defined on suitable domains by

$$f(x) = 3x + 5 \text{ and } g(x) = 2 - x.$$

Find an expression for $f(g(x))$.

- 2 A curve has equation $y = x^3 - 2x + 5$.

What is the gradient of the tangent at the point where $x = 2$?

- 3 What is the nature of the roots of the quadratic equation $x^2 + 10x = 25$?

- 4 Solve $2\cos 2x^\circ - 3\cos x^\circ + 1 = 0$ for $0^\circ \leq x^\circ \leq 360^\circ$

Task 2

- 1 Given that $y = \sin^4 x$, find $\frac{dy}{dx}$.

- 2 A circle with centre $(-2, 1)$ passes through the point $(5, -2)$.

What is the equation of the circle?

- 3 Find $\int \frac{2}{\sqrt[3]{x}} dx$.

- 4 How many solutions are there to $(3\cos x + 4)(2\sin x - 1) = 0$, and why?

Task 3

- 1 A sequence is defined by the recurrence relation

$$u_{n+1} = 2u_n - 5, \quad u_0 = 6$$

What is the value of u_2 ?

- 2 What is the gradient of the line parallel to the line with equation $3x + 4y - 8 = 0$.

- 3 What is the exact value of $\sin \frac{5\pi}{4} + \cos \frac{\pi}{4}$?

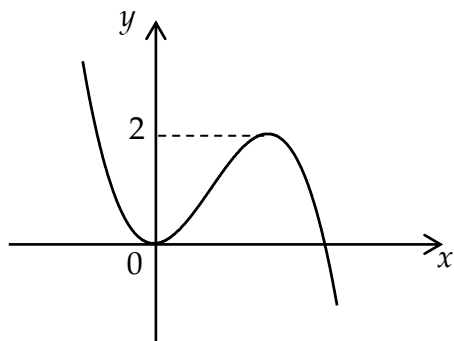
- 4 If $\sin x^\circ = \frac{2}{\sqrt{6}}$ find the exact value of $\cos 2x^\circ$.

Task 4

- 1 Given that $\log_a 9 = \frac{2}{3}$, what is the value of a ?
- 2 S is the point with coordinates $(2, -1, 1)$, T $(4, 1, 5)$ and U $(5, 2, 7)$.
Find the ratio in which T divides SU.
- 3 Given that $y = 4\sin(3x - 2)$, find $\frac{dy}{dx}$.
- 4 Solve $\sin 2x^\circ - \cos x^\circ = 0$, for $0^\circ \leq x^\circ \leq 360^\circ$.

Task 5

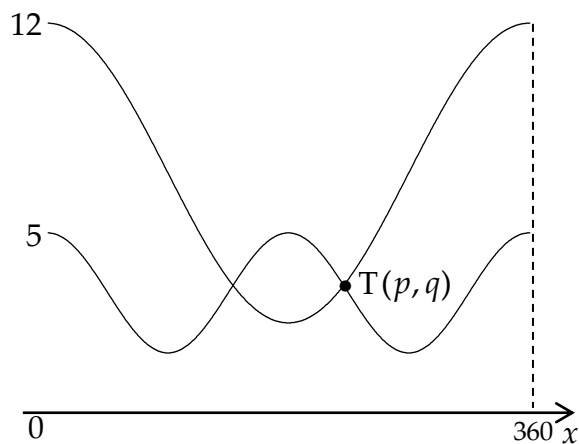
- 1 The diagram shows the graph of $y = f(x)$.



Sketch the graph of $y = 2 - f(x)$.

- 2 The diagram shows the graphs of $y = 2\cos(2x)^\circ + 3$ and $y = 7 + 5\cos(x)^\circ$ for $0 \leq x \leq 360$.

The two graphs intersect at T, which has coordinates (p, q) .



- (a) Find the exact value of $\cos p$.
- (b) Determine the value of p .