

Springburn Academy : Mathematics Department

Higher Mathematics : Lesson Starters

Block 3 (Circle 3)

Without using a calculator :

Task 1

- 1 Write $x^2 - 10x - 3$ in the form $(x + a)^2 + b$
- 2 Solve $\sin 2x = \frac{1}{2}$ for $0 \leq x \leq \pi$.
- 3 Differentiate $\frac{5}{\sqrt{x}}$ wrt x .
- 4 Find the equation of the tangent to the circle $(x+3)^2 + (y-5)^2 = 16$ passing through the point $(0, 1)$.

Task 2

- 1 If $f(x) = \sqrt{x^3} + 9$ find $f'(x)$.
- 2 What is the max. value of $3\sin(2x - 35)^\circ$?
- 3 Solve $\cos x = \frac{1}{2}$ for $0 \leq x < 2\pi$.
- 4 Show that the line $y = x - 1$ intersects the circle $x^2 + y^2 + 10x + 8y - 8 = 0$

Task 3

- 1 Why is $x^2 + y^2 + 4x - 6y + 13 = 0$ not the equation of a circle?
- 2 If $u_{n+1} = 3u_n - 7$, $u_2 = -10$, find u_0 .
- 3 Write down the exact value of $7\sin\frac{11\pi}{6}$
- 4 What is the min. value of $2x^2 + 11$?

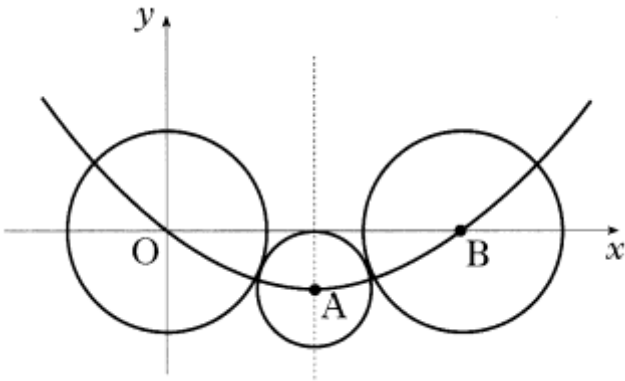
Task 4

- 1 Convert 30° to radian measure.
- 2 Solve $\frac{15}{2x} = \frac{1}{3}$.
- 3 What is the value of $\sin^2 45^\circ + \cos^2 45^\circ$?
- 4 Find the equation of the tangent to the circle $(x-3)^2 + (y-2)^2 = 36$ through the point $(-3, 2)$.

Task 5

O, A and B are the centres of the three circles shown in the diagram. The two outer circles are congruent, each touches the smallest circle. Circle centre A has equation

$$(x - 12)^2 + (y + 5)^2 = 25$$



The three centres lie on a parabola whose axis of symmetry is shown the by broken line through A.

- a) i) State coordinates of A and find length of line OA.
- ii) Hence find the equation of the circle with centre B.
- b) The equation of the parabola can be written in the form $y = px(x+q)$, find p and q