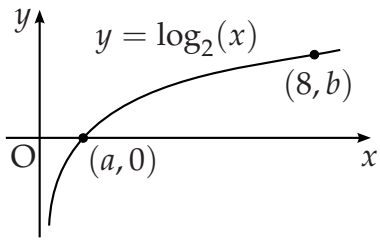
Old Past Papers - Functions and Graphs

[SQA] 1. The diagram shows a sketch of part of the graph of $y = \log_2(x)$.



(*a*) State the values of a and b. **1**

(*b*) Sketch the graph of $y = \log_2(x+1) - 3$. **3**

[SQA] 2. $f(x) = 3 - x$ and $g(x) = \dfrac{3}{x}, x \neq 0$.

(*a*) Find $p(x)$ where $p(x) = f(g(x))$. **2**

(*b*) If $q(x) = \dfrac{3}{3-x}, x \neq 3$, find $p(q(x))$ in its simplest form. **3**

[SQA] 3. Given $f(x) = x^2 + 2x - 8$, express $f(x)$ in the form $(x+a)^2 - b$. **2**

[SQA] 4. (*a*) Express $f(x) = x^2 - 4x + 5$ in the form $f(x) = (x-a)^2 + b$. **2**

(*b*) On the same diagram sketch:

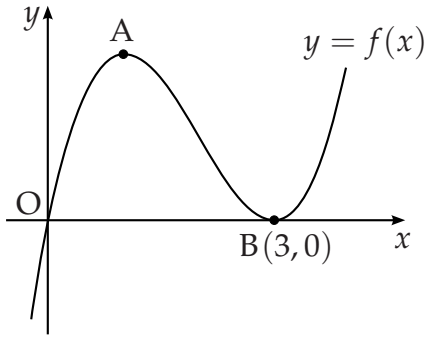
(i) the graph of $y = f(x)$;

(ii) the graph of $y = 10 - f(x)$. **4**

(*c*) Find the range of values of x for which $10 - f(x)$ is positive. **1**

[SQA] 5. A sketch of the graph of $y = f(x)$ where $f(x) = x^3 - 6x^2 + 9x$ is shown below.

The graph has a maximum at A and a minimum at $B(3, 0)$.



(a) Find the coordinates of the turning point at A. **4**

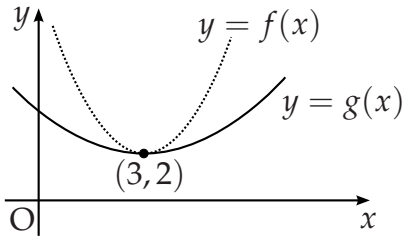
(b) Hence sketch the graph of $y = g(x)$ where $g(x) = f(x + 2) + 4$.

Indicate the coordinates of the turning points. There is no need to calculate the coordinates of the points of intersection with the axes. **2**

(c) Write down the range of values of k for which $g(x) = k$ has 3 real roots. **1**

[SQA] 6. The diagram shows the graphs of two quadratic functions $y = f(x)$ and $y = g(x)$. Both graphs have a minimum turning point at $(3, 2)$.

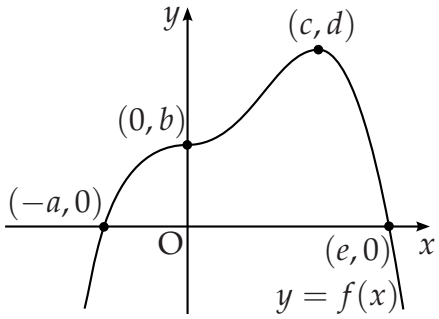
Sketch the graph of $y = f'(x)$ and on the same diagram sketch the graph of $y = g'(x)$. **2**



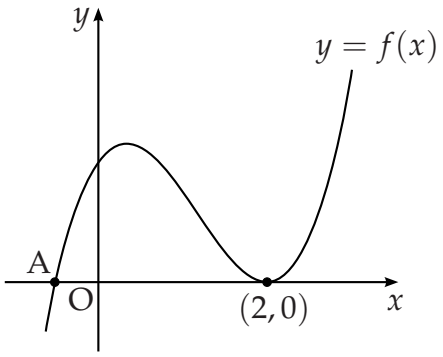
[SQA] 7. The graph of a function f intersects the x-axis at $(-a, 0)$ and $(e, 0)$ as shown.

There is a point of inflexion at $(0, b)$ and a maximum turning point at (c, d).

Sketch the graph of the derived function f'. **3**



[SQA] 8. The diagram shows part of the graph of the curve with equation $y = 2x^3 - 7x^2 + 4x + 4$.



(*a*) Find the x-coordinate of the maximum turning point. **5**

(*b*) Factorise $2x^3 - 7x^2 + 4x + 4$. **3**

(*c*) State the coordinates of the point A and hence find the values of x for which $2x^3 - 7x^2 + 4x + 4 < 0$. **2**

[SQA] 9. Functions $f(x) = \sin x$, $g(x) = \cos x$ and $h(x) = x + \frac{\pi}{4}$ are defined on a suitable set of real numbers.

(*a*) Find expressions for:

(i) $f(h(x))$;

(ii) $g(h(x))$. **2**

(*b*) (i) Show that $f(h(x)) = \frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{2}}\cos x$.

(ii) Find a similar expression for $g(h(x))$ and hence solve the equation $f(h(x)) - g(h(x)) = 1$ for $0 \leq x \leq 2\pi$. **5**

[SQA] 10. Functions f and g are defined on suitable domains by $f(x) = \sin(x^\circ)$ and $g(x) = 2x$.

(*a*) Find expressions for:

(i) $f(g(x))$;

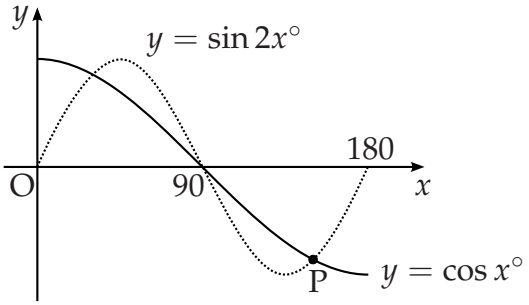
(ii) $g(f(x))$. **2**

(*b*) Solve $2f(g(x)) = g(f(x))$ for $0 \leq x \leq 360$. **5**

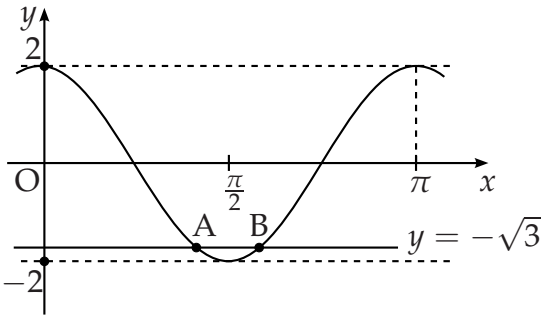
[SQA] 11. (*a*) Solve the equation $\sin 2x^\circ - \cos x^\circ = 0$ in the interval $0 \leq x \leq 180$. **4**

(*b*) The diagram shows parts of two trigonometric graphs, $y = \sin 2x^\circ$ and $y = \cos x^\circ$.

Use your solutions in (*a*) to write down the coordinates of the point P. **1**



[SQA] 12. The diagram shows the graph of a cosine function from 0 to π.



(*a*) State the equation of the graph. **1**

(*b*) The line with equation $y = -\sqrt{3}$ intersects this graph at point A and B.

Find the coordinates of B. **3**

[END OF QUESTIONS]