# YEAR 12 AS Mathematics

| Question | Maximum Mark | Mark Awarded |
|---|---|---|
| 1 | 8 | |
| 2 | 10 | |
| 3 | 7 | |
| 4 | 4 | |
| 5 | 2 | |
| 6 | 9 | |
| 7 | 4 | |
| 8 | 6 | |
| 9 | 6 | |
| 10 | 14 | |
| 11 | 5 | |
| | | |
| | | |
| Total Mark | | 75 |

**1.** Simplify

(a) $\dfrac{3\sqrt{3}+1}{5\sqrt{3}-7}$, [4]

(b) $\left(\sqrt{12}\times\sqrt{24}\right)+\dfrac{\sqrt{150}}{\sqrt{3}}-\dfrac{36}{\sqrt{2}}$. [4]

**2.**

(a) Express $x^2 + 4x - 8$ in the form $(x + a)^2 + b$, where $a$ and $b$ are constants whose values are to be found. [2]

(b) Use an algebraic method to solve the simultaneous equations $y = x^2 + 4x - 8$ and $y = 2x + 7$. [4]

(c) Draw a sketch illustrating geometrically the results of both part *(a)* and part *(b)*. [4]

**3.** Given that the quadratic equation

$$(k-1)x^2 + 2kx + (7k-4) = 0$$

has no real roots, show that

$$6k^2 - 11k + 4 > 0.$$

Find the range of values of $k$ satisfying this inequality. [7]

**4.** Solve the inequality $2x^2 + 11x + 12 \geqslant 0$. [4]

**5.**

(b) Differentiate $9x^{\frac{5}{4}} - \dfrac{8}{\sqrt[3]{x}}$ with respect to $x$. [2]

**6.** The curve $C$ has equation $y = x^2 - 8x + 14$.

(a) The point $P$ has coordinates (6, 2) and lies on the curve $C$. Find the equation of the **normal** to $C$ at $P$. [5]

(b) The point $Q$ lies on $C$ and is such that the **tangent** to $C$ at $Q$ has equation

$$y = 2x + c,$$

where $c$ is a constant. Find the coordinates of $Q$ and the value of $c$. [4]

7. (a) Given that $y = -5x^2 - 7x + 13$, find $\dfrac{dy}{dx}$ [2]

(b) Differentiate $6x^{\frac{3}{4}} + \dfrac{5}{x^3} - 9$ with respect to $x$. [2]

8. (a) Given that $x - 3$ is a factor of $px^3 - 13x^2 - 19x + 12$, write down an equation satisfied by $p$. Hence show that $p = 6$. [2]

(b) Solve the equation $6x^3 - 13x^2 - 19x + 12 = 0$. [4]

9. Solve the equation $6x^3 - 13x^2 + 4 = 0$. [6]

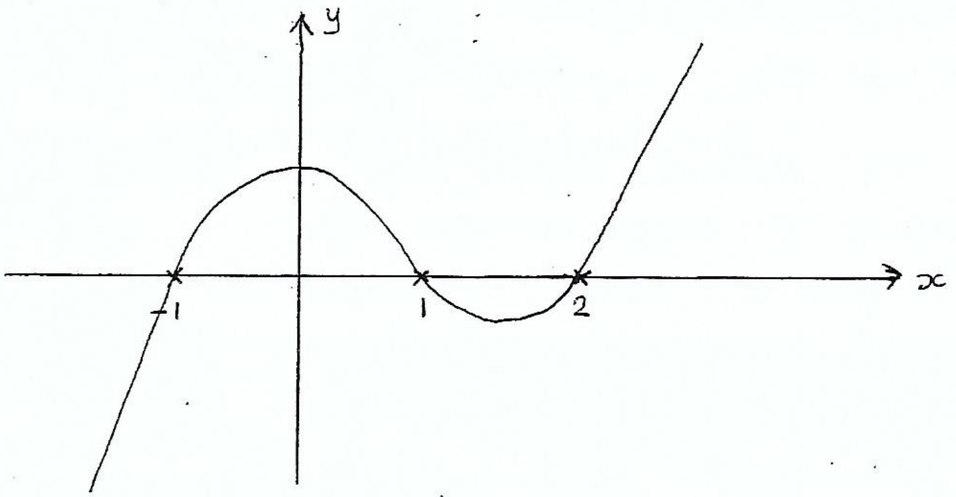
10. The points $A$ and $B$ have coordinates $(6, -2)$ and $(4, 1)$, respectively.
The line $L_1$ passes through the point $B$ and is perpendicular to $AB$.

(a) (i) Find the gradient of $AB$.
(ii) Find the equation of $L_1$. [5]

(b) The line $L_2$ passes through $A$ and has equation $x - 8y - 22 = 0$.
The lines $L_1$ and $L_2$ intersect at the point $C$.

(i) Show that $C$ has coordinates $(-2, -3)$.
(ii) Find the coordinates of the mid-point of $AC$.
(iii) Find the area of triangle $ABC$, simplifying your answer. [9]

11. Find the equation of the curve shown below




[5]