ALL questions should be attempted.

Marks

1. The point A has coordinates (7, 4). The straight lines with equations $x + 3y + 1 = 0$ and $2x + 5y = 0$ intersect at B.

(*a*) Find the gradient of AB. **3**

(*b*) Hence show that AB is perpendicular to only one of these two lines. **5**

2. $f(x) = x^3 - x^2 - 5x - 3$.

(*a*) (i) Show that $(x + 1)$ is a factor of $f(x)$.

(ii) Hence or otherwise factorise $f(x)$ fully. **5**

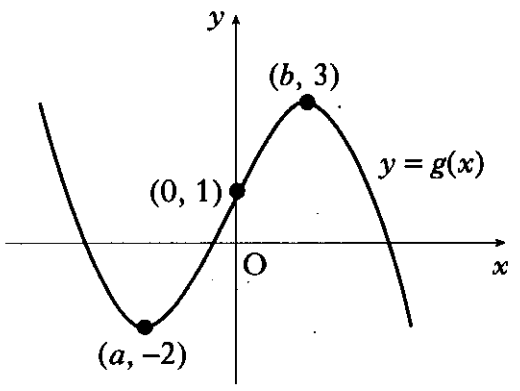
(*b*) One of the turning points of the graph of $y = f(x)$ lies on the x-axis. Write down the coordinates of this turning point. **1**

3. Find all the values of x in the interval $0 \leq x \leq 2\pi$ for which $\tan^2(x) = 3$. **4**

4. The diagram shows the graph of $y = g(x)$.

(*a*) Sketch the graph of $y = -g(x)$. **2**

(*b*) On the same diagram, sketch the graph of $y = 3 - g(x)$. **2**



5. A, B and C have coordinates (–3, 4, 7), (–1, 8, 3) and (0, 10, 1) respectively.

(*a*) Show that A, B and C are collinear. **3**

(*b*) Find the coordinates of D such that $\overrightarrow{AD} = 4\overrightarrow{AB}$. **2**

6. Given that $y = 3\sin(x) + \cos(2x)$, find $\frac{dy}{dx}$. **3**

[Turn over for Questions 7 to 11 on *Page four*

Marks

7. Find $\int_0^2 \sqrt{4x+1}\, dx$. **5**

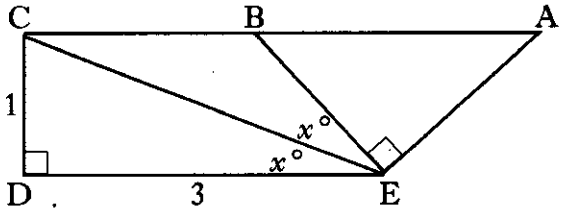
8. (*a*) Write $x^2 - 10x + 27$ in the form $(x + b)^2 + c$. **2**

(*b*) Hence show that the function $g(x) = \frac{1}{3}x^3 - 5x^2 + 27x - 2$ is always increasing. **4**

9. Solve the equation $\log_2(x + 1) - 2\log_2(3) = 3$. **4**

10. In the diagram
angle DEC = angle CEB = $x°$ and
angle CDE = angle BEA = 90°.
CD = 1 unit; DE = 3 units.

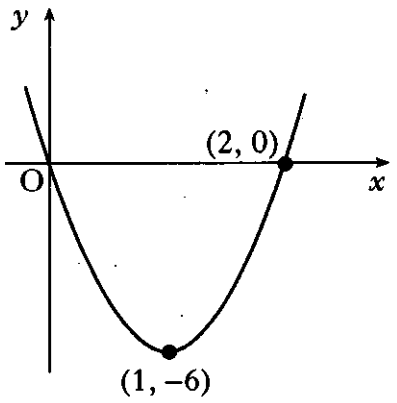
By writing angle DEA in terms of $x°$, find the exact value of cos(DÊA). **7**



11. The diagram shows a parabola passing through the points (0, 0), (1, −6) and (2, 0).

(*a*) The equation of the parabola is of the form $y = ax(x - b)$.
Find the values of a and b. **3**

(*b*) This parabola is the graph of $y = f'(x)$.
Given that $f(1) = 4$, find the formula for $f(x)$. **5**



[END OF QUESTION PAPER]