

Higher Mathematics – Homework B

Non-calculator section:

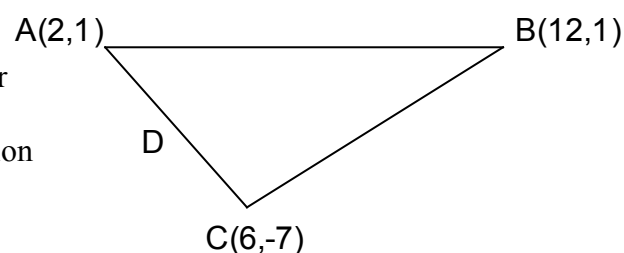
- (a) Given $y = x^2 - 12x + 1$, express y in the form $(x + a)^2 + b$.
(b) Hence, or otherwise, write down the turning point of y .
- Given $(x - 2)$ is a factor of $f(x) = x^3 - x^2 + kx + 12$, find the value of k .
Hence factorise $f(x)$ completely.
- The roots of $mx^2 + 4mx + 16 = 0$ are equal. Find the value of m given $m \neq 0$.
- The recurrence relations

$$u_{n+1} = 0.8u_n + 12 \quad \text{and} \quad v_{n+1} = av_n + 18$$

have the same limit. Find the value of a .

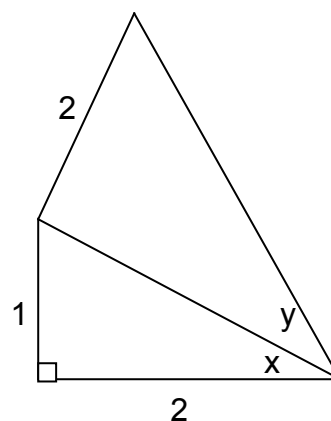
- A triangle ABC has vertices $A(2,1)$, $B(12,1)$ and $C(6,-7)$.

- Find the equation of the median BD .
- Write down the equation of the perpendicular bisector of AB .
- Find the coordinates of the point of intersection of these two points.



- Using the information opposite show that

the exact value of $\cos(x + y)$ is $\frac{2\sqrt{5} - 2}{3\sqrt{5}}$

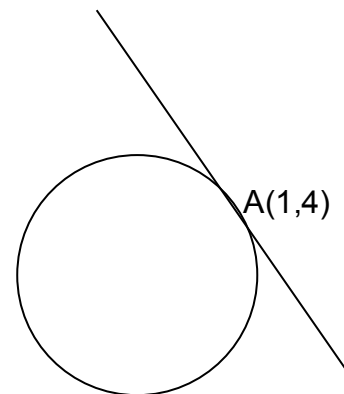


- (a) Show that the function $f(x) = x^3 + 3x^2 + 3x - 15$ is never decreasing.
(b) Find the coordinates of the stationary point of $f(x)$.

Calculator section:

8. (a) Find the equation of the tangent to the circle $x^2 + y^2 + 10x - 2y - 19 = 0$ at the point $A(1,4)$.

(b) Show that this tangent is also a tangent to the parabola $y = 2x^2 - 10x + 14$ and find the point of contact.



9. A curve has equation $y = 4\sqrt{x} - \frac{8}{x}$. Find the equation of the tangent to this curve at the point where $x = 4$.

10. Solve the equation $3\sin 2x = 3\cos x$ for $0 \leq x \leq 360$

11. $\frac{dy}{dx} = \frac{5x^2 - x}{\sqrt{x}}$. Given $y = \frac{1}{3}$ when $x = 1$, find a formula for y .