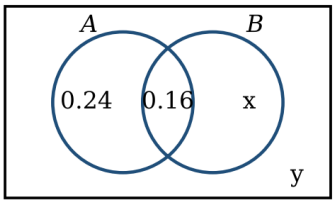
Day 339 **A Level Maths: B Tier 10-a-day**

1 A model boat moves so that its position vector relative to O at time t s is $\mathbf{r} = (t^2 + 3t)\mathbf{i} + (2t^3)\mathbf{j}$ metres.
Find the velocity when t = 2, and the speed at that time.

2 Points A, B and C have position vectors $\begin{pmatrix} -2 \\ -3 \\ -2 \end{pmatrix}$, $\begin{pmatrix} 0 \\ -6 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} -4 \\ 0 \\ r \end{pmatrix}$ respectively.
Given that A, B, C are collinear, find r.

3 The Venn diagram shows probabilities for events A and B, which are independent.
Find the values of x and y.

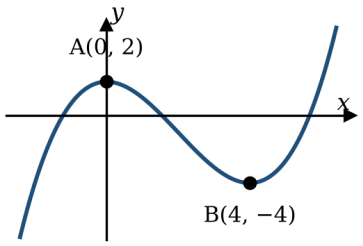


4 Solve $4x^2 - 18x + 20 \geq 0$.

5 Line l_1: $\mathbf{r} = \begin{pmatrix} -10 \\ 3 \\ -2 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ 0 \\ 0 \end{pmatrix}$.
Line l_2: $\mathbf{r} = \begin{pmatrix} 2 \\ 2 \\ 0 \end{pmatrix} + \mu \begin{pmatrix} 3 \\ -1 \\ 2 \end{pmatrix}$.
Show that l_1 and l_2 intersect and find the point.

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6 The diagram shows the curve y = f(x). A and B are the turning points. Find the turning points of:
(a) y = f(2x) (b) y = f(−x)



7 A particle moves so that at time t s its velocity is $\mathbf{v} = (2t^2 + 5)\mathbf{i} + (2t - 8)\mathbf{j}$ m s^{-1}.
Find the time when the particle is moving in the direction of **i**, and its speed then.

8 (a) Show that $x^2 - 5x - 3 = 0$ can be written as $x = \sqrt{5x + 3}$.
(b) Use $x_{n+1} = \sqrt{5x_n + 3}$ with $x_0 = 3$ to find x_1, x_2, x_3 to 4 d.p.

9 Solve the equation $3^{2x} - 36 \times 3^x + 243 = 0$.

10 A coin is thought to land heads with probability 0.5. It is tossed 40 times and lands heads 13 times.
Test, at the 5% significance level, whether the probability of heads is different from 0.5.