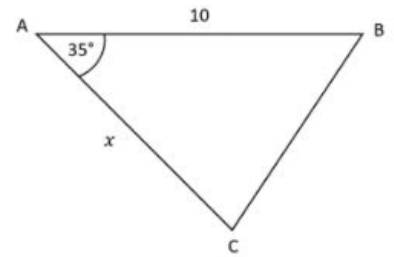


Math SL PROBLEM SET 99

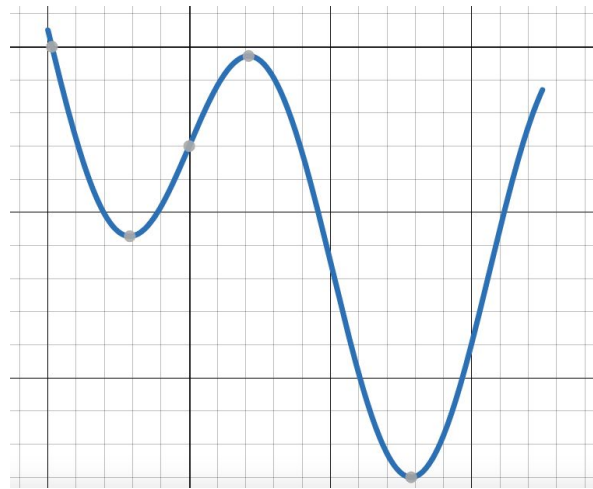
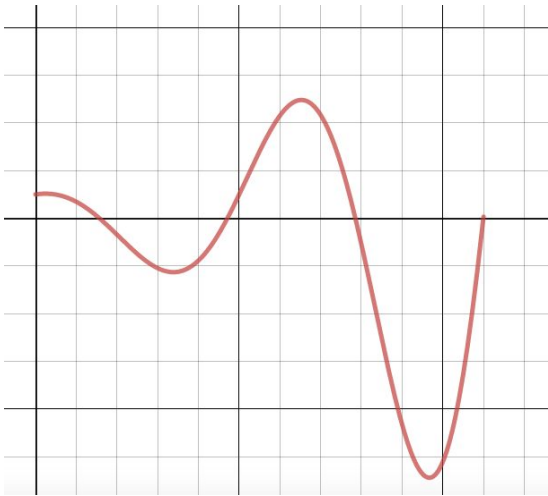
- (CA6.3) (CI/CA)** The graph of the equation $y = e^x(1 - x^2)$ has two points of inflexion. Find the equations of the first and second derivatives and hence, find the coordinates of each of the inflection points. Then use a calculator to approximate the x - and y -coordinates to three significant figures.
- (V4.2) (CI)** Find the possible value(s) of a if:
 - The cosine ratio of the angle between $\mathbf{v} = a\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ and $\mathbf{w} = 3\mathbf{j} - 3\mathbf{k}$ is $\frac{\sqrt{3}}{6}$.
 - The cosine ratio of the angle between $\mathbf{v} = 4\mathbf{i} + 3\mathbf{j}$ and $\mathbf{w} = -\mathbf{i} + 2\mathbf{j} + a\mathbf{k}$ is $\frac{2}{25}$.

- (T3.6) (CA)** The diagram shows $\triangle ABC$. The area of $\triangle ABC$ is 22 cm^2 .

- Find x .
- Find BC .
- Find $\angle ACB$.



- (CA6.3) (CI)** Here are the graphs of 2 functions, f (in red) and g (in blue). Each graph represents the DERIVATIVE of a function. For each function, prepare a graph of the ORIGINAL function.



- (F2.4) (CI)** Consider the quadratic function $g(x) = 2x^2 - 16x + 29$.
 - Express $g(x)$ in the form of $a(x - h)^2 + k$.
 - State the coordinates of the vertex and the equation of the line of symmetry.
 - Find the exact values of the x -coordinates of the zeroes of g .
 - Is the function g a one-to-one function?

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6. **(V4.2 - R) (CI)** Points A, B, and C have position vectors $4\mathbf{i} + 2\mathbf{j}$, $\mathbf{i} - 3\mathbf{j}$ and $-5\mathbf{i} - 5\mathbf{j}$. Let D be a point on the x -axis such that ABCD forms a parallelogram.
- (i) Find vector BC. (ii) Find the position vector of D.
 - Find the angle between vectors BD and AC.

The line L_1 passes through A and is parallel to $\mathbf{i} + 4\mathbf{j}$. The line L_2 passes through B and is parallel to $2\mathbf{i} + 7\mathbf{j}$. A vector equation of L_1 is $\mathbf{r} = (4\mathbf{i} + 2\mathbf{j}) + s(\mathbf{i} + 4\mathbf{j})$.

- Write down a vector equation of L_2 in the form $\mathbf{r} = \mathbf{b} + t\mathbf{q}$.
 - The lines L_1 and L_2 intersect at the point P . Find the position vector of P .
7. **(SP5.9 - R) (CA)** The heights of the flowers in a flower bed are normally distributed with a mean of 43 cm and a standard deviation of 6 cm. Flowers are classified as tall flowers if they have a height that is more than 48 cm.
- A flower is selected at random. Find the probability that this flower is a tall flower.
 - Given that this flower is tall, find the probability that it is taller than 55 cm.
 - Two flowers are selected at random. Find the probability that they are both tall.

Five hundred flowers are selected at random.

- Find the expected value of these flowers that are tall.
 - Find the probability that at least 100 of these flowers are tall.
8. **(SP5.6; SP5.8) (CA)** A bag contains 10 balls. 6 of the balls are green and 4 of the balls are red. A ball is selected at random, its colour is noted, and then it is replaced.
- What is the probability that the ball was green?

A total of 8 selections takes place. After each time, the ball is replaced.

- What is the probability that a green ball was selected on each of the 8 occasions?
- What is the probability that, in any order, a green ball was selected on four occasions, and a red ball was selected on four occasions?
- What is the probability that a red ball was selected at least twice?

A game is played as follows: If a green ball is drawn then a score of -1 is awarded. If a red ball is drawn then a score of $+1$ is awarded. A total of 8 selections takes place.

- (i) What is the probability of getting an odd score?
(ii) What is the probability that 0 was scored in total?
(iii) Five people play this game. What is the probability that at least one of the people scores 0 after making the 8 selections?
(iv) Given that one of the contestants scores -2 , what is the probability that the first two balls drawn were the same colour?