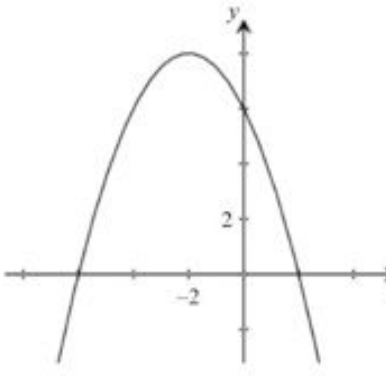
Math SL PROBLEM SET 65

1. **(SP5.5 - R) (CI)** A bag contains 4 green marbles and 6 yellow marbles. Sam selects one marble from the bag and then **without** replacement, he selects a second marble. **(Oxford 3.5, p89)**

   a. Write down the probability that the first marble Sam selects is green.
   b. Find the probability that Sam selects two green marbles.
   c. Find the probability that Sam selects two marbles of different colour.

2. **(F2.4 - R) (CI)** Here is part of the graph of a quadratic function, $f(x)$, as shown below. The graph passes through the points (-6,0), (-2,8) and (2,0). **(Cirrito 2.4, p39)**



   a. Write down the equation of the axis of symmetry
   b. Write the function f in the form $f(x) = a(x - h)^2 + k$.

3. **(SP5.7 - R) (CI)** Here is a probability distribution for a discrete random variable X in the table below. Given that $E(X) = 2.8$, find the value of a and the value of b. **(Cirrito 16.2, p535)**

x	0	1	3	4
$P(X = x)$	0.1	a	0.5	b

4. **(T3.5 - R) (CI)** Solve $2\cos\left(\frac{x}{2}\right) - 1 = 0$ on the domain of $-\pi < x < \pi$. **(Cirrito 10.4, p351)**

5. **(CA6.2 - R) (CI)** Find the equations of the lines that are tangent to the following functions at the points specified. **(Cirrito 19.3, p618)**

   a. $g(x) = \sqrt[3]{-3x^2 - 5}$ at the point (1,-2)
   b. $f(x) = \ln(\sin x)$ at the point $\left(\frac{\pi}{6}, -\ln 2\right)$.
   c. $h(x) = e^{2x^2 - 2x}$ at the point $\left(\frac{1}{2}, \frac{1}{\sqrt{e}}\right)$.
   d. $m(x) = \cos^3 x$ at the point $\left(\frac{\pi}{3}, \frac{1}{8}\right)$.

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6. **(C6.2 - R) (CI)** Find the first four derivatives of $y = e^{2x} + e^{-2x}$ and then write a generalization for finding $\frac{d^n y}{dx^n}$ for this function. **(Cirrito 19.3, p618; Cirrito 19.4, p636)**

7. **(C6.3 - R) (CI)** Given the quartic function $f(x) = 2x^4 - 4x^3 - 4$ on the domain of $-1 \leq x \leq 2$. **(Cirrito 20.2, p649)**

   a. Find the x co-ordinates of the extrema and classify them as minimum(s), maximum(s) or neither. Show/explain your justification for your classification of the extrema.
   b. Determine the x co-ordinates of the inflection points and the intervals of concavity.
   c. Evaluate $f(0)$.
   d. Given your analysis in Q(a) and Q(b) and Q(c), sketch the function.

8. **(V4.2, V4.3 - R) (CI)** Given quadrilateral PQRS with its vertices at P(5,10), Q(-5,8), R(-7,-8) and S(7,0). **(Cirrito 12.7, p444)**

   a. Find vector **PR** and **QS**.
   b. Show that vector **PR** is perpendicular to vector **QS**.

   The lines PR and QS can be written in vector form.

   c. Find a vector equation for line PR and find a vector equation for line QS.

   The vectors **PR** and **QS** intersect at the point T.

   d. Using your vector equations from Q(c), find the coordinates of T.