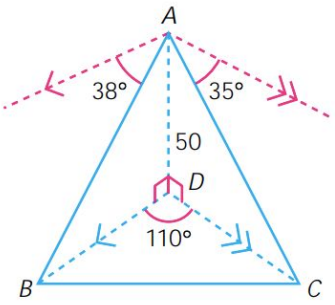
Math SL PROBLEM SET 45

Section A (Short Answer)

1. **(F2.3 - R) (CI)** The zeroes of an original function, $Q(x)$, are $x = -4$, $x = 5$ and $x = 8$. Find the zeroes of the given functions: **(Cirrito 6.1, 6.2, p173 & p177)**

   a. $f(x) = Q(4x)$ b. $t(x) = Q(x - 3)$ c. $k(x) = Q(2x - 5)$ d. $j(x) = 3Q(x + 2)$

2. **(T3.6 - E) (CA)** Roeland is about to bungie jump from the top of a 50 m high bridge. From Roeland's position, he sees two of his friends down on the ground. David is S50°W and is seen with an angle of depression of 38°, while Omar is S60°E and is seen with a 35° angle of depression. How far apart are David and Omar? **(Cirrito 9.6, p308)**



3. **(CA6.2 - N) (CA)** Given the cubic function $y = x^3 - 3x^2 - 9x$; **(Cirrito 20.3, p672)**

   a. Find the first derivative and sketch it and then determine the (i) location of the extrema; and (ii) the intervals(s) of increase and decrease of the function.
   b. Find the equation of the derivative of the derivative from Q(a). NOTE: this is obviously referred to as the **second derivative**.
   c. Find the zero(s) of the second derivative and suggest what the significance of this point(s) might be.

4. **(CA6.2 - N) (CA)** Use DESMOS to graph $y = \sin(x)$ and use this graph to sketch the graph of the derivative function of $y = \sin(x)$. Predict the equation of the derivative based upon this sketch and then verify the equation of the derivative using Wolframalpha. **(Cirrito 19.3, p618)**

5. **(CA6.2 - N) (CA)** Use DESMOS to graph $y = \cos(x)$ and use this graph to sketch the graph of the derivative function of $y = \cos(x)$. Predict the equation of the derivative based upon this sketch and then verify the equation of the derivative using Wolframalpha. **(Cirrito 19.3, p618)**

6. **(A1.2, F2.6, F2.7 - R) (CI)** Solve for x in each equation: **(Cirrito 7.4, p219)**

   a. $\log_3(2x + 1) = 2$
   b. $\ln(x + 3) - \ln(10) = -\ln(x)$

Math SL PROBLEM SET 45

7. **(F2.1, F2.5, C6.1 - R) (CI)** Consider the function $g(x) = \frac{a}{x-b}$. The line $x = 5$ is a vertical asymptote to the graph of $g(x)$. We also are given the fact that $g(3) = -4$. **(Cirrito 5.3.5, p144)**

   a. Write down the value of b.
   b. Find the value of a.
   c. Find the equation of $g^{-1}(x)$.
   d. Find $\lim_{x \to \infty} g^{-1}(x)$

Section B (Extended Response/Investigation)

8. **(C6.2 - N) (CA)** For our "parent functions" $y = 1/x$, $y = e^x$, $y = \ln(x)$, and $y = \sqrt{x}$; **(Cirrito 19.3, p618)**

   a. Graph each function using DESMOS (sketch into your notebooks)
   b. Use DESMOS to graph the derivative of each function; (include sketch)
   c. Use Wolframalpha to find the equation of the derivative of each function

9. **(F2.3 - R) (CI)** Suppose we know the following information about the function $f(x)$. The domain is $-10 \leq x \leq 15$; the range is $-20 \leq y \leq 15$; the x-intercepts are at $x = -1$ and $x = 7$; the y-intercept is at $y = 10$ and there is a global maximum at (2,15). For each of the functions below, identify the domain, range, x- and y-intercepts and global maximum if possible. If there is not enough information to identify any feature, explain why this is the case. **(Cirrito 6.1, 6.2, p173 & p177)**

   a. $g(x) = -2f(2x)$ b. $m(x) = f(x + 5) - 1$ c. $k(x) = f(2 - x)$ d. $t(x) = f(0.5x) + 6$