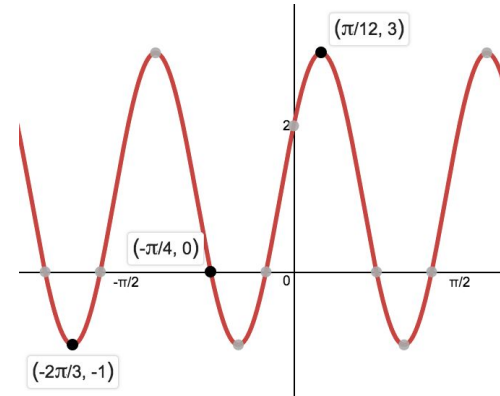


# Math SL PROBLEM SET 43

## Section A (Short Answer)

1. **(F2.5 - R) (CI)** For the rational function  $r(x) = \frac{2x-5}{x-2}$ ,  $x \neq 2$ , determine: **(Cirrito 5.3.5, p144)**
- the equation(s) of the asymptote(s) and the intercepts of  $r(x)$ .
  - Evaluate  $\lim_{x \rightarrow \infty} r(x)$ .
  - Rewrite the equation of  $r(x)$  in the form  $r(x) = a + \frac{b}{x-2}$ ;  $a, b \in \mathbb{Z}$ .
  - Hence, determine the transformations that were applied to  $y = \frac{1}{x}$  to create  $r(x)$ .

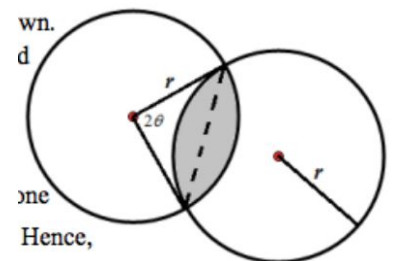
2. **(T3.4, F2.3 - R) (CI)** Here is a graph of a transformed sinusoidal function. Determine an equation for this function and hence, state what transformations need to be applied to transform the function back to its original parent function. **(Cirrito 10.3, p337)**



3. **(SP5.4 - R) (CA)** The table below gives the number of hours spent studying for a math exam and the final exam grade.

Hours studied	2	5	1	0	4	2	3
Exam grade	77	92	70	63	90	75	84

- Use your calculator to determine the equation of the line of best fit.
  - If Farida studies 2.75 hours, what grade should she expect?
  - If Amina studies 10 hours, what grade should she expect? Explain your answer.
  - How many hours should Mohamed study in order to get a grade of 97%.
  - Write down the value of the correlation coefficient and explain what it means in the context of this problem.
4. **(T3.1 - N) (CA)** Two circles with the same radius,  $r$ , intersect as shown. The angle subtended by the common chord (dashed line in diagram) at the center of each circle is  $2\theta$ . **(Cirrito 9.7.3, p311)**



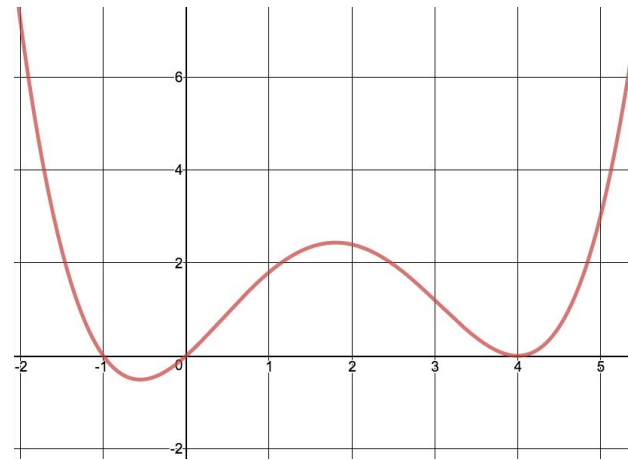
- Find an expression in terms of  $r$  and  $\theta$  for the shaded area.
- If the shaded area is equal to  $\frac{1}{4}$  of the area of one of the two circles, show that  $8\theta - 4\sin 2\theta = \pi$ .
- Hence, find  $\theta$  accurate to three significant figures.

# Math SL PROBLEM SET 43

5. **(SP5.7 - N) (CA)** For a discrete random variable,  $X$ , the probability distribution is defined by the table below : Find: **(Cirrito C16.1, p533)**

$x$	-2	-1	0	1	2
$P(X=x)$	$k$	$5k^2$	0.35	0.15	0.1

- a. The value of the constant,  $k$ .
- b. Hence, find  $P(X < 0)$
- c. Find  $E(X) \Rightarrow$  i.e. the **expected value** of  $X$
6. **(C6.3 - N) (CI)** Here is the graph of the **derivative of a function**,  $\frac{d}{dx} f(x)$ . The graph of the derivative provides some information about the original function,  $f(x)$ . List what you can figure out about the original function and then prepare a sketch of the original function.



## Section B (Extended Response/Investigation)

7. **(T3.2, CA6.3 - N) (CI)** The derivative of a function is  $\frac{d}{dx} f(x) = x - 2x \cos(x)$ , where  $0 \leq x \leq 2\pi$ .
- Factor this derivative equation:  $\frac{d}{dx} f(x) = x - 2x \cos(x)$
  - Hence, determine where the original function,  $f(x)$ , has its extrema.
  - Evaluate  $\frac{d}{dx} f\left(\frac{\pi}{6}\right)$  and  $\frac{d}{dx} f(\pi)$  and  $\frac{d}{dx} f(2\pi)$ .
  - Determine the intervals in which the **original** function is (i) increasing, (ii) decreasing.
  - Hence, sketch the **original** function from the information you have from the derivative.
8. **(C6.1 - N) (CA)** Given the function  $g(x) = \frac{1}{x+3}$ , **(Cirrito 18.3, p592)**
- determine the value of  $g(1)$  as well as determining an expression for  $g(1+h)$
  - and hence, determine an expression for the difference quotient,  $\frac{g(1+h) - g(1)}{h}$
  - What does  $\lim_{h \rightarrow 0} \frac{g(1+h) - g(1)}{h}$  represent, geometrically?
  - What would you predict the derivative of  $g(x) = \frac{1}{x+3}$  to be?
  - Now, repeat the limit calculation for  $g(x) = \frac{1}{2x+3}$ .
  - Hence, predict the equation of the derivative function for  $g(x) = \frac{1}{mx+b}$ .