

# Math SL PROBLEM SET 3

---

## Section B

1. (**F2.6, F2.7, F2.8 - R**) (CA) Mr. Santowski is taking medicine for MATHITIS. Once he has taken the medicine, it gets used up by his body and the amount of medicine that remains in his body is modelled by the equation  $A(t) = 50(0.7)^{0.2t}$ , where  $A$  is measured in milligrams and  $t$  is measured in hours. (*Cirrito 7.2, p209*)
  - a. Determine the initial dose of medicine.
  - b. Evaluate  $A(12)$  and interpret the meaning of the result.
  - c. Every 12 hours, Mr. S takes **another dose**. Prepare a SKETCH of the graph looks like, on the domain of  $0 \leq t \leq 48$
  - d. How much medicine does he have in his body **after** taking his:
    - i. second dose?
    - ii. third dose?
  - e. At what time(s) in the first 36 hours does Mr. S have at least 40 mg of medicine in his body?
  
2. (**F2.1, 2.3 - R**) (CI) Two functions are defined as follows:  $f(x) = 2x^2 - 6$  and then  $g(x) = x - 5$ . Both functions are limited to a domain of  $\{-4 \leq x \leq 4\}$ . (*Cirrito 5.4.1, p148; Cirrito 5.4.2, p157*)
  - a. State the range of both functions,  $f(x)$  and  $g(x)$ .
  - b. A new function,  $h(x)$  is defined as the composite of  $f(x)$  with  $g(x)$  (as in  $h(x) = f \circ g(x)$ ). Write the equation of  $h(x)$ .
  - c. The new function,  $h(x)$ , represents a transformed version of  $f(x)$ . Describe what transformations have been applied to  $f(x)$  to create the function of  $h(x)$ .
  - d. Mr. S asks if the order of composition makes a difference. Determine the equation for the composite of  $g$  with  $f$  i.e.  $g \circ f(x)$  and hence, answer Mr. S's question.
  - e. Determine the equation of the inverse of  $h(x)$ .
  - f. Find the intersection point(s) of  $h(x)$  and its inverse.

# Math SL PROBLEM SET 3

3. **(C6.1, 6.3; F2.1 - N,R)** (CA) Given the cubic polynomial defined by  $P(x) = (x - 3)(x + 1)(x + 4)$ , answer the following questions about this function. *(Cirrito 5.2.1, p115; Cirrito 18.1.3, p582)*

- Evaluate  $P(-2)$ .
- Solve  $P(x) = -2$ .
- In which domain interval are the function values of  $P(x)$  increasing?
- A difference quotient is defined by the following “formula”  $\Rightarrow \frac{P(x_2) - P(x_1)}{x_2 - x_1}$ .

Calculate the value of difference quotient between the  $x$  values of  $x = -2$  and  $x = 0$ .

Explain what this value means.

Your calculator has the ability to draw tangent lines on the graphs of your functions (to find the DRAW menu, go to 2nd  $\Rightarrow$  PRGM  $\Rightarrow$  5  $\Rightarrow$  now input your  $x$  value, for example,  $x = -3$ ).

- Draw the line that is tangent to  $P(x)$  at  $x = -3$  and write down its equation.
  - At which  $x$ -values would you expect the tangent lines to be horizontal? Why?
  - Explain the significance of the slope of the tangent line, given the cubic function.
4. **(F2.1, 2.7, T3.6 - R)** (CI) Given the functions  $f(x) = 2x - 5$  and  $g(x) = \sqrt{9 - x}$ , *(Cirrito 5.2.1, p115, Cirrito 5.4.2, p157)*
- State the domain and range of  $y = g(x)$ .
  - Determine the equation of  $y = g^{-1}(x)$ .
  - Solve the equation  $f(x) = g(x)$  and state the meaning of the solution.
  - Given your work in Q(c), state the solution set for  $f(x) > g(x)$ .
  - Determine the measure of the angle that the line  $y = 2x - 5$  makes with the positive  $x$  axis.