

# Math SL PROBLEM SET 85

## Section A (Skills/Concepts Consolidation)

- (F2.1, F2.3, C6.1, C6.5 - R) (CI)** The function  $f$  is defined as  $f(x) = \sqrt{2x - 1}$ .
  - Sketch a graph of  $f$ , labelling 3 points on the function.
  - Sketch a graph of:
    - $y = f(2x)$
    - $y = f(-x)$
    - $y = -\frac{1}{2}f\left(\frac{1}{2}x\right) + 2$
  - Find the equation of the inverse of  $f$ .
  - Determine the equation for:
    - $y = \frac{df}{dx}$
    - $y = \int f(x)dx$
- (C6.1 - R) (CI)** Given the parabola  $f(x) = (2x - 1)^2 + c$  and the line  $g(x) = 2x - 1$ , determine:
  - The transformational effect of  $c$  (what does  $c$  do to the parabola?)
  - The intersection point(s) of  $f(x)$  and  $g(x)$ , if  $c = 0$ .
  - Find the value of  $c$  such that  $g(x)$  is tangent to  $f(x)$ .
- (C6.5 - R) (CI)** Two lines are defined by
$$L_1 = \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 1 \\ -2 \end{pmatrix}; L_2 = \begin{pmatrix} -2 \\ 2 \\ -1 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix};$$
  - Rewrite the equation for  $L_1$  in parametric form and in Cartesian form.
  - Find (if possible) the point at which the lines intersect.
- (F2.5, C6.1, 6.5 - R) (CI)** Given the function  $h(x) = \frac{1}{2x-1}$ ,  $x \neq \frac{1}{2}$ .
  - Find the asymptote(s) and intercept(s) of  $h$  and sketch the function.
  - Find the equation of the inverse of  $h$ .
  - Find the equation of the line normal to  $h(x)$  at the point where  $x = 2$ .
  - Find the area under the curve of  $h$  between  $x = 1$  and  $x = 4$ .
- (SP5.7 - R) (CA)** The discrete random variable,  $X$ , has a probability distribution defined as  $P(X) = \frac{K}{2x-1}$ ,  $x = 1, 2, 3, 4, 5$  and  $K$  is constant.
  - Find the value of  $K$ .
  - Find  $P(X = 3)$
  - Find  $P(X > 2)$
  - Find  $P(X = 3 | X > 2)$

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## Section B (Skills/Concepts Practice)

6. **(F2.7 - R) (CI) SKILL:** Solving Equations: Solve for  $x$ :

a.  $(x - 3)(x - 4) = x$       b.  $\ln(x + 3) - \ln(x) = 1$       c.  $\frac{2}{x-1} > \frac{1}{2}$

7. **(F2.7 - R) (CI) SKILL:** Solving Equations. Given the equation  $\log(6) + \log(x - 3) = \log(y)$ .

- a. Find an expression for  $y$  in terms of  $x$  for  $\log(6) + \log(x - 3) = \log(y)$   
b. Solve the system of equations defined by  $\log(6) + \log(x - 3) = \log(y)$  and  $2y - x = 3$ .

8. **(F2.7 - R) (CI) SKILL:** Solving Equations. For the equation  $3^x + 3^{-x} = \frac{10}{3}$ ,

- a. Show that if  $a + \frac{1}{a} = \frac{10}{3}$ , then  $3a^2 - 10a + 3 = 0$ .  
b. Hence or otherwise, solve  $3^x + 3^{-x} = \frac{10}{3}$

9. **(F2.7, T3.5 - R) (CI) SKILL:** Solving Equations. Given the expression  $2x - 1$ :

- a. Solve i.  $(2x - 1)^2 = 4$       ii.  $\log_2(2x - 1) = 4$       iii.  $\frac{1}{2x-1} + 2x - 1 = 4$   
b. Given  $0 < x < 2\pi$ , solve i.  $\sin(2x) - 1 = 0$       ii.  $\sin^2(x) - 1 = 0$       iii.  $\tan(2x) - 1 = 0$