Math SL PROBLEM SET 68

Section A (Short Answer)

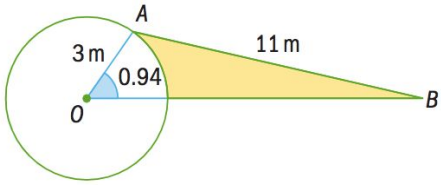
1. **(F2.5 - R) (CI)** Given the rational function $g(x) = \frac{x+1}{2x-4}$, $x \neq 2$, **(Oxford 5.3, p147)**

   a. Determine the domain and range of this function
   b. Find the equation(s) of the asymptotes.
   c. Find the x- and y-intercepts.
   d. Sketch the function.
   e. Find the equation of the inverse function.
   f. Find the equation of the line tangent to the curve $g(x)$ at the point where x = -1

2. **(A1.1 - R) (CA)** You are given two series. **(Oxford 6.8, p181)**

   a. The first series has the formula $S_n = 3n^2 - 2n$.
      i. Find the values of S_1, S_2 and S_3.
      ii. Find the u_1, u_2 and u_3.
      iii. Find an expression for u_n for this first series.
   b. The second series has the formula $S_n = 2^{n+2} - 4$.
      i. Find the values of S_1, S_2 and S_3.
      ii. Find the u_1, u_2 and u_3.
      iii. Find an expression for u_n for this second series.

3. **(T3.1 - R) (CA)** The diagram shows the circle, center O, with radius 3 m, AB = 11 and angle AOB = 0.94 radians. **(Oxford 11.7, p391)**



   a. Find the shaded area.
   b. Is line segment AB tangent to the circle? Show supporting evidence.

4. **(CA6.6 - E) (CA)** The velocity, v, in ms^{-1} of a particle moving in a straight line is given by the function $v(t) = t^2 - 9$, where t is time in seconds. **(Oxford 9.7, p321)**

   a. Find the acceleration of the particle at $t = 1$.
   b. The initial displacement of the particle is 12 meters. Find an equation for the displacement function, $s(t)$.
   c. Find the **net** distance traveled as well as the **total** distance traveled between 2 s and 8 s.

5. **(A1.3 - R) (CA)** Find the constant term in the expansion of $\left(2x^2 - \frac{3}{x}\right)^6$. **(Oxford 6.9, p184)**

Math SL PROBLEM SET 68

6. **(F2.1, F2.6 - R) (CA)** Consider the functions $t(x) = e^x$ and $m(x) = \sqrt{x}$. **(Cirrito 5.4.2, p164)**

   a. Find the equations of $t^{-1}(x)$ and $m^{-1}(x)$.
   b. Find the equations of $tom(x)$ and $mot(x)$ and state the domain of each composite.
   c. Find the equations for $(tom)^{-1}(x)$ and $(mot)^{-1}(x)$ and state the domain of each inverse.

Section B (Extended Response/Investigation)

7. **(CA6.5 - N) (CA)** To introduce volumes of rotation: **(Oxford 9.6, p318)**

   a. Watch these videos to introduce the idea of "solids of revolution":

      i. Concept ⇒ https://www.youtube.com/watch?v=3oAjcLD34kc
      ii. Concept: First five minutes of https://www.youtube.com/watch?v=mQj0w8nVyc4
      iii. And finally here's how to do the math ⇒ https://www.youtube.com/watch?v=FGF0wP6THq4

   b. Try it yourself: To find the volume of the solid formed when the region bounded by the curve $g(x) = 6 - 2x$ and the x-axis between $x = 0$ and $x = 3$ is rotated 360° around the x-axis:

      i. Graph the function $g(x) = 6 - 2x$, between $x = 0$ and $x = 3$.
      ii. Shade in the region between $g(x)$ and the x-axis, between $x = 0$ and $x = 3$.
      iii. Perform the relevant integration to determine the volume of the 3D solid that would result from the rotation.
      iv. What 3D shape do you get?
      v. Determine the volume of this familiar 3D shape by using its volume formula.

8. **(CA6.5 - E) (CI)** Consider the function $f(x) = x^4 - x^2$. **(Oxford 9.5, p313)**

   a. Find the zeroes of $f(x)$.
   b. Find $\frac{d}{dx} f(x)$ and hence find the coordinates of the minimum and maximum point(s).
   c. Sketch $f(x)$.
   d. Sketch $g(x) = 1 - x^2$ on the same axes.
   e. Find the area of the region bounded between f and g.