

DP2 SL Exam Prep Topic 5 Paper 1 [62 marks]

1. The function g is defined by $g(x) = e^{x^2+1}$, where $x \in \mathbb{R}$.

Find $g'(-1)$.

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2. (a) The expression $\frac{3\sqrt{x}-5}{\sqrt{x}}$ can be written as $3 - 5x^p$. Write down the value of p . [1]

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- (b) Hence, find the value of $\int_1^9 \left(\frac{3\sqrt{x}-5}{\sqrt{x}} \right) dx$. [4]

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3. The derivative of the function f is given by $f'(x) = \frac{6x}{x^2+1}$.

The graph of $y = f(x)$ passes through the point $(1, 5)$. Find an expression for $f(x)$.

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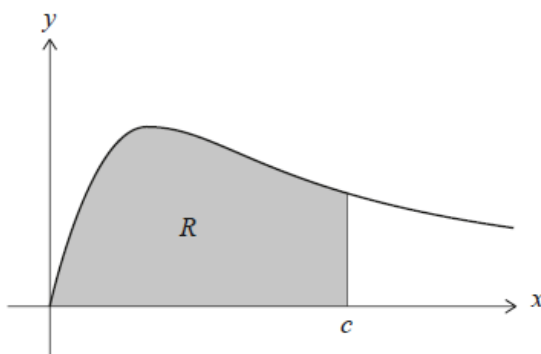
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- Find the value of k .

[5]

5. 23M.1.SL.TZ2.5

The following diagram shows part of the graph of $y = \frac{x}{x^2+2}$ for $x \geq 0$.



The shaded region R is bounded by the curve, the x -axis and the line $x = c$.

The area of R is $\ln 3$.

Find the value of c .

[6]

- 6.** The function f is defined for all $x \in \mathbb{R}$. The line with equation $y = 6x - 1$ is the tangent to the graph of f at $x = 4$.

(a) Write down the value of $f'(4)$.

[1]

(b) Find $f(4)$.

[1]

The function g is defined for all $x \in \mathbb{R}$ where $g(x) = x^2 - 3x$ and $h(x) = f(g(x))$.

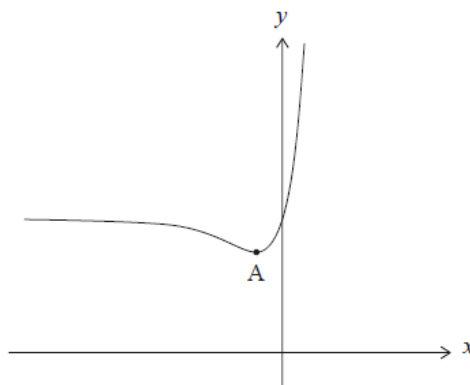
(c) Find $h(4)$.

[2]

(d) Hence find the equation of the tangent to the graph of h at $x = 4$.

[3]

7. The function h is defined by $h(x) = 2xe^x + 3$, for $x \in \mathbb{R}$. The following diagram shows part of the graph of h , which has a local minimum at point A .



(a) Find the value of the y -intercept.

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(b) Find $h'(x)$.

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(c) Hence, find the coordinates of A .

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(d.i) Show that $h''(x) = (2x + 4)e^x$.

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(d.ii) Find the values of x for which the graph of h is concave-up.

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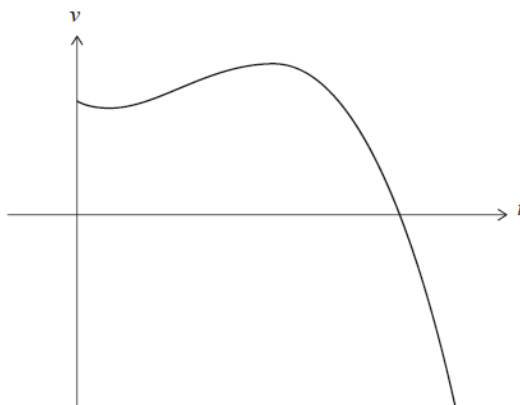
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8. An object moves along a straight line. Its velocity, $v \text{ m s}^{-1}$, at time t seconds is given by $v(t) = -t^3 + \frac{7}{2}t^2 - 2t + 6$, for $0 \leq t \leq 4$. The object first comes to rest at $t = k$.

The graph of v is shown in the following diagram.



At $t = 0$, the object is at the origin.

- (a) Find the displacement of the object from the origin at $t = 1$.

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(d) Find the greatest speed reached by the object for $0 \leq t \leq 4$.

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(e) Write down an expression that represents the distance travelled by the object while its speed is increasing. Do not evaluate the expression.

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