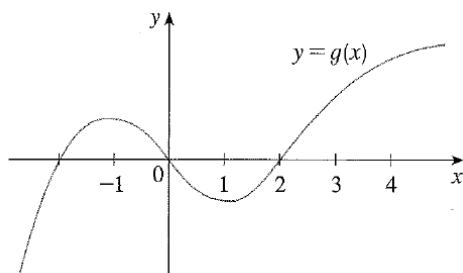


NCEA Level 2 Mathematics (Calculus)

Questions

1. For the function g graphed below, arrange the following in increasing order: 0 , $g'(-2)$, $g'(0)$, $g'(4)$, $g'(2)$.



2. The velocity $v \text{ ms}^{-1}$ of an object t seconds after it passes a fixed point can be modelled by the function

$$v(t) = 4t^3 - t^2 + 2t. \quad (1)$$

Find the equation for the acceleration of the object.

3. Find the equation of the tangent to the curve

$$f(x) = x^3 - 2x^2 + x \quad (2)$$

at the point $(2, 2)$ on the curve.

4. Find the slope of the tangent to the curve

$$y = \frac{1}{\sqrt{x}} \quad (3)$$

at the point where $x = a$.

5. In an area surrounding a farming airstrip there is a height restriction for fireworks of 50 m. The height h metres above the ground reached by a firework t seconds after it is fired can be modelled by the function

$$h = 20t - 5t^2. \quad (4)$$

Will the firework break the 50 m limit?

6. If a ball is thrown into the air with a velocity of 10 m s^{-1} , its height y in metres after t seconds is given by

$$y = 10t - 4.9t^2. \quad (5)$$

Find the velocity of the ball when $t = 2$.

7. Show that the polynomial

$$9x^3 + 50x^2 + 120x - 67 \quad (6)$$

has exactly one real root.

8. Suppose that f is a function of x such that

$$f'(x) = 8x^3 + 6x + 2. \quad (7)$$

Find an expression for $f(x)$.

9. Prove the following inequality for all $0 < a \leq b$:

$$\frac{a+b}{2} \geq \sqrt{ab}. \quad (8)$$
