

Further Calculus

Marks

1. Differentiate the following expressions with respect to x .
 - (a) $y = 3x^2 - 7x + 3\cos x$ 2
 - (b) $y = (1 + 2x)^3$ 2

2. Differentiate the following expressions with respect to x .
 - (a) $\frac{1}{2(3x^2 + 4)^2}$ 3
 - (b) $\frac{3}{x} - \sin(2x)$, $x \neq 0$ 3

3. The function g is defined on a suitable domain by $g(t) = (\sin t + \cos t)^3$.
Find a formula for $g'(t)$. 2

4. Find the following indefinite integrals.
 - (a) $\int 3\cos x \, dx$ 2
 - (b) $\int \frac{dx}{(3x+2)^3}$, $x \neq -\frac{2}{3}$ 3
 - (c) $\int 2\cos(3+4x) + \frac{3}{x^2} \, dx$, $x \neq 0$ 3

5. Find the exact value of $\int_0^{\frac{\pi}{2}} \sin x + (2x + \pi)^3 \, dx$. 5

6. Find the equation of the tangent to the curve with equation $y = \sin 3x + 3$ at the point where $x = \frac{\pi}{3}$. 5

7. An expression is such that $\frac{dy}{dt} = \sin\left(t - \frac{5\pi}{6}\right) + \cos\left(t - \frac{2\pi}{3}\right)$. Given that $y = 4$ when $t = \frac{5\pi}{6}$, find an expression for y in terms of t . 5

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