

1) Let  $g(x) = x^3 \ln(4 - x^2)$ , for  $-2 < x < 2$ .  
Find  $g'(x) =$  .

2) Let  $g(x) = 2x \sin x$ .

(a) Find  $g'(x)$ .

(b) Find the gradient of the graph of  $g$  at  $x = \pi$ .  
(Hint :  $\sin \pi = 0$ ,  $\cos \pi = -1$ )

3) Let  $f(x) = \cos 2x$  and  $g(x) = \ln(3x - 5)$ .

(a) Find  $f'(x)$ .

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

(c) Let  $h(x) = f(x) / g(x)$ . Find  $h'(x)$ .

4) Let  $f(x) = e^{-3x}$  and  $g(x) = \sin^2 3x$

(a) Write down

(i)  $f'(x)$ ;

(ii)  $g'(x)$ .

(b) Let  $h(x) = e^{-3x} \sin^2 3x$ . Find the exact value of  $h'$ .

5) Let  $f(x) = e^x \cos x$ . Find the gradient of the normal to the curve of  $f$  at  $x = \pi$ .  
(Hint :  $\sin \pi = 0$ ,  $\cos \pi = -1$ )

6) Let  $f(x) = x^2 - 3x + 1$ .

(a) Find  $f(x + h)$ .

(Hint :  $(a + b)^2 = a^2 + 2ab + b^2$ )

(b) Use 1st principle of differentiation with limit to show that the derivative of  $f(x)$  is  $2x - 3$ .

7) Let  $f(x) = e^{3x^2} - \ln(\sin x)$ ,  
(a) Find  $f'(x)$

(b) Find  $f''(x)$

8) Let  $f(x) = 3x^2 + ax + b$ ;  
(a) If  $f'(2) = 14$  find  $a$

(b) If  $f(2) = 20$  find  $b$

9) Let  $f(x) = \frac{4}{\sqrt{3x^2 - 4x + e^{2x}}}$ ,

Find  $f'(x)$

10) Let  $f(x) = \frac{4\ln(x^2-3x)}{\sqrt{\sin 2x^3}}$ ,

Find  $f'(x)$

11) Find the equation of tangent to the curve  $y = 3x^2 - 4x + 5$  at point  $x = 1$ .

12) The tangent equation to curve  $y = 2x^3 + ax + b$  at point  $(1, 5)$  is  $y = 3x - 2$ ; where  $a$  and  $b$  are constants.

(a) Find  $a$

(b) Find  $b$

13) Let  $g(x) = x^3 - 3x^2 - 9x + 5$ .

Find the two values of  $x$  at which the tangent to the graph of  $g$  is horizontal.

**14)** Let  $f(x) = (\sin 3x)$ ,

(a) Find  $f'(x)$

(b) Find  $f''(x)$

(c) Find  $f'''(x)$

(d) Find  $f^{12}(x)$