

**Higher Ink Exercise**  
**Block 1 – Differentiation (B)**

**Calculators should only be used when necessary**

1. Find  $\frac{dy}{dx}$  where  $y = \frac{2x^4 - 3x^2 + 5}{\sqrt{x}}$  (3)

2. Given that  $y = \sqrt{5x^2 + 3}$ , find  $\frac{dy}{dx}$ . (4)

3. Given that  $y = 3\sin(x) + \cos(2x)$ , find  $\frac{dy}{dx}$ . (3)

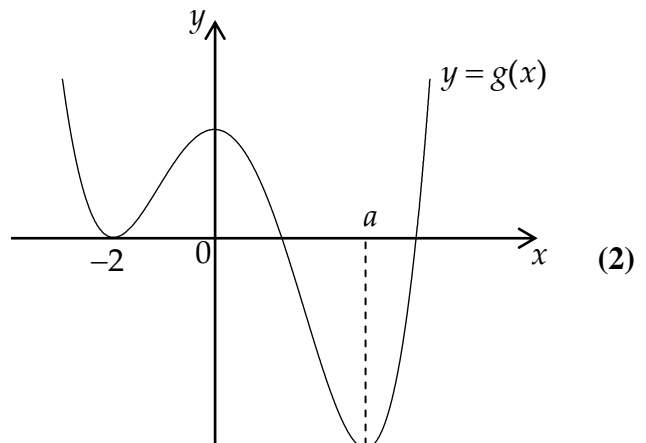
4. Given that  $f(x) = 5(7 - 2x)^3$ , find the value of  $f'(4)$ . (4)

5. If  $y = \frac{1}{x^3} - \cos 3x$ ,  $x \neq 0$ , find  $\frac{dy}{dx}$ . (3)

6. A curve has equation  $y = x - \frac{16}{\sqrt{x}}$ ,  $x > 0$ .

Find the equation of the tangent at the point where  $x = 4$ . (5)

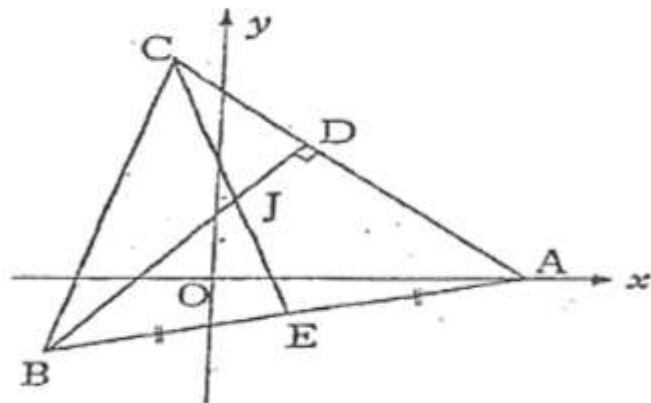
7. The diagram shows part of the quartic with equation  $y = g(x)$ . There are stationary points at  $x = -2$ ,  $x = 0$  and  $x = a$ . Sketch the graph of  $y = g'(x)$ .



8. A function  $f$  is defined by the formula  $f(x) = 3x - x^3$ .
- (a) Find the exact values where the graph of  $y = f(x)$  meets the  $x$  and  $y$  axes. (2)
- (b) Find the coordinates of the stationary points of the function and determine their nature. (7)
- (c) Sketch the graph of  $y = f(x)$ . (2)

9.  $f(x) = 6x^3 - 5x^2 - 17x + 6$ .
- (a) Show that  $(x - 2)$  is a factor of  $f(x)$ . (2)
- (b) Express  $f(x)$  in its fully factorised form. (2)

10. In the diagram, A is the point  $(7, 0)$ , B is  $(-3, -2)$  and C is  $(-1, 8)$ .  
The median CE and the altitude BD intersect at J.



- (a) Find the equations of CE and BD. (6)
- (b) Find the coordinates of J. (2)

**TOTAL = 47 MARKS**