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**Differentiation from First Principles**

(Gaeaf 2005)

7. Differentiate  $x^2 + 4x + 3$  from first principles. [5]

(Haf 2005)

5. Given  $y = x^2 - 7x + 2$ , find  $\frac{dy}{dx}$  from first principles. [5]

(Gaeaf 2006)

8. (a) Given that  $y = 2x^2 - 5x + 3$ , find  $\frac{dy}{dx}$  from first principles. [5]

- (b) Given that  $y = \frac{a}{x} + 2x^{\frac{3}{2}}$  and  $\frac{dy}{dx} = 7$  when  $x = 4$ , find the value of the constant  $a$ . [4]

(Haf 2006)

7. (a) Given that  $y = x^2 - 3x + 4$ , show from first principles that

$$\frac{dy}{dx} = 2x - 3. \quad [5]$$

- (b) Differentiate  $\frac{2}{x^2} + 7\sqrt{x}$  with respect to  $x$ . [2]

(Gaeaf 2007)

5. (a) Given that  $y = 2x^2 - 5x + 3$ , find  $\frac{dy}{dx}$  from first principles. [5]

- (b) Find the equation of the normal to the curve  $y = 2x^2 - 5x + 3$  at the point (2, 1). [3]

(Haf 2007)

6. Given  $y = x^2 - 12x + 10$ , find  $\frac{dy}{dx}$  from first principles. [5]

(Gaeaf 2008)

6. (a) Given that  $y = 3x^2 - 4x + 7$ , find  $\frac{dy}{dx}$  from first principles. [5]

- (b) Differentiate  $5\sqrt{x} - \frac{3}{x^3}$  with respect to  $x$ . [2]

(Haf 2008)

4. (a) Given that  $y = 5x^2 + 3x - 4$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = \frac{8}{x} + 3\sqrt{x}$ , find the value of  $\frac{dy}{dx}$  when  $x = 4$ . [4]

(Gaeaf 2009)

8. (a) Given that  $y = 7x^2 + 5x - 2$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $\frac{2}{x^3} + 5x^{\frac{2}{3}}$  with respect to  $x$ . [2]

(Haf 2009)

5. (a) Given that  $y = 4x^2 - 5x - 3$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $7x^{\frac{3}{4}} - \frac{2}{x^4}$  with respect to  $x$ . [2]

(Gaeaf 2010)

6. (a) Given that  $y = 3x^2 - 7x - 5$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = ax^{\frac{5}{2}}$  and  $\frac{dy}{dx} = -2$  when  $x = 4$ , find the value of the constant  $a$ . [3]

(Haf 2010)

7. (a) Given that  $y = -x^2 + 5x - 9$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = \frac{3}{4}x^{\frac{1}{3}} + \frac{12}{x^2}$ , find the value of  $\frac{dy}{dx}$  when  $x = 8$ . [4]

(Gaeaf 2011)

4. (a) Given that  $y = 6x^2 + 4x - 9$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $\frac{3}{x^4} - 7x^{\frac{1}{3}}$  with respect to  $x$ . [2]

(Haf 2011)

6. (a) Given that  $y = 7x^2 - 5x + 2$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $4x^{\frac{2}{5}} - \frac{9}{x} - 6$  with respect to  $x$ . [2]

(Gaeaf 2012)

7. (a) Given that  $y = 8x^2 - 5x - 6$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = \frac{a}{x} + 10\sqrt{x}$  and that  $\frac{dy}{dx} = 3$  when  $x = 4$ ,  
find the value of the constant  $a$ . [4]

(Haf 2012)

7. (a) Given that  $y = 3x^2 - 7x + 5$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $\frac{2}{3}x^{\frac{1}{4}} + \frac{12}{x^3}$  with respect to  $x$ . [2]

(Gaeaf 2013)

6. (a) Given that  $y = -x^2 + 4x - 6$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $5x^{\frac{4}{3}} - \frac{9}{\sqrt{x}}$  with respect to  $x$ . [2]

(Haf 2013)

7. (a) Given that  $y = 5x^2 + 8x - 11$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $6x^{\frac{2}{3}} + \frac{5}{x^2} - 4$  with respect to  $x$ . [2]

(Gaeaf 2014)

8. (a) Given that  $y = 7x^2 - 6x - 3$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = ax^{\frac{4}{3}} + 24x^{\frac{1}{2}}$  and that  $\frac{dy}{dx} = \frac{11}{2}$  when  $x = 64$ ,  
find the value of the constant  $a$ . [4]

(Haf 2014)

7. (a) Given that  $y = -3x^2 + 8x - 7$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $9x^{\frac{5}{4}} - \frac{8}{\sqrt[3]{x}}$  with respect to  $x$ . [2]

(Haf 2015)

7. (a) Given that  $y = 9x^2 - 8x - 3$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $\frac{3}{x^6} - 4x^{\frac{5}{3}}$  with respect to  $x$ . [2]

(Haf 2016)

8. (a) Given that  $y = 10x^2 - 7x - 13$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = 4\sqrt{x} + \frac{45}{x}$ , find the value of  $\frac{dy}{dx}$  when  $x = 9$ . [4]

(Haf 2017)

9. (a) Given that  $y = -5x^2 - 7x + 13$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Differentiate  $6x^{\frac{3}{4}} + \frac{5}{x^3} - 9$  with respect to  $x$ . [2]

(Haf 2018)

7. (a) Given that  $y = 9x^2 - 7x - 8$ , find  $\frac{dy}{dx}$  from first principles. [5]
- (b) Given that  $y = \frac{k}{x} + 14\sqrt{x}$  and that  $\frac{dy}{dx} = 2$  when  $x = 9$ , find the value of the constant  $k$ . [4]