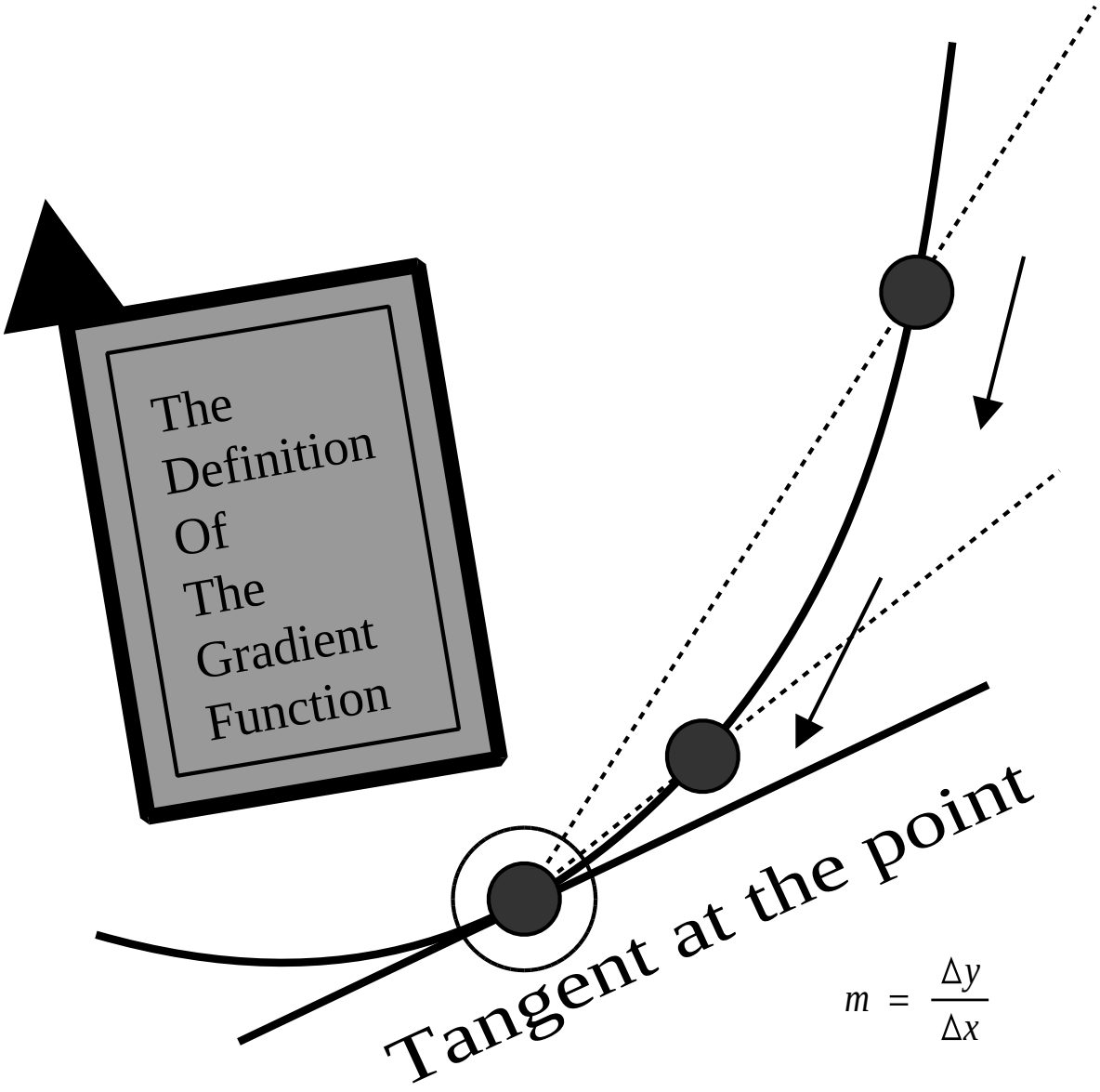
DIFFERENTIATION II

A-Level Pure Mathematics
~ Year 1 ~



$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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II

Lesson 1

A-Level Pure Mathematics : Year 1
Differentiation II

1.1 Revision

In GCSE a technique is studied that allows the gradient equation of a simple curve to be immediately written down simply from looking at the equation of that curve. The key move is this:

If $y = x^n$ then $\frac{dy}{dx} = n\,x^{n-1}$ for any constant n

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1.2 "Together" Examples

Each of the following is the equation of a curve.
For each curve, write down its gradient equation.

(i) $y = \frac{7}{2}x^4 + \frac{1}{3}x^2 + 5x + 3$ $\frac{dy}{dx} =$

(ii) $y = 8\sqrt{x} + \frac{3}{x^2}$ $\frac{dy}{dx} =$

(iii) $y = \frac{4x + 7}{x}$ $\frac{dy}{dx} =$

(iv) $y = \left(5 + \sqrt{x}\right)^2$ $\frac{dy}{dx} =$

[8 marks]

1.3 Exercise

Marks Available : 40

Question 1

For each of these equations, write down the corresponding gradient equation.

(i) $y = \frac{9}{5}x + \frac{4}{3}$ $\qquad \frac{dy}{dx} =$

(ii) $y = \frac{7x^4}{6}$ $\qquad \frac{dy}{dx} =$

(iii) $y = (5x + 3)^2$ $\qquad \frac{dy}{dx} =$

(iv) $y = 3 - 17x$ $\qquad \frac{dy}{dx} =$

(v) $y = \frac{4}{x^{2.5}}$ $\qquad \frac{dy}{dx} =$

(vi) $y = 18\sqrt{x} + \frac{5}{x^3}$ $\qquad \frac{dy}{dx} =$

[12 marks]

Question 2

$$f(x) = \frac{5}{6}x^2 - \frac{7}{2}x^4$$

Find $f'(x)$

[2 marks]

Question 3

$$g(x) = \frac{4x^9}{3} + \frac{3x^6}{2}$$

Find $g'(x)$

[2 marks]

Question 4

$$h(x) = \frac{5}{4}x^2 + \frac{1}{3}x + 2$$

Find $h'(x)$

[2 marks]

Question 5

$$p(x) = \frac{4 + x^2}{x^3} \qquad \text{HINT} : p(x) = \frac{4}{x^3} + \frac{x^2}{x^3}$$

Find $p'(x)$

[3 marks]

Question 6

$$y = \frac{10x + 1}{x^2}$$

Find $\frac{dy}{dx}$

[3 marks]

Question 7

$$y = \frac{3x^2 + x}{\sqrt{x}}$$

Find $\frac{dy}{dx}$

[3 marks]

Question 8

$$y = (3 - 2x)^n$$

If you know the binomial theorem, find $\frac{dy}{dx}$ when $n = 4$ otherwise when $n = 2$

[4 marks]

Question 9

$$w(x) = 3x^3 + \frac{2}{x^3}$$

Find $w'(x)$

[3 marks]

Question 10

$$e(x) = \frac{2}{5x^4}$$

Find $e'(x)$

[3 marks]

Question 11

$$k(x) = 3x^3\left(2x^2 - x^5\right)$$

Find $k'(x)$

[3 marks]