DIFFERENTIATION & FUNCTIONS (Q 6, 7 & 8, PAPER 1)

2000



An 6	SWERS	5 7							
	(b)	(i) 8	, [0, 10]						
		(11)	x	2	8	14	20	26	
			f(x)	10	0	5	0	0	
	(c)	(i) -2, 1		(ii) $10x - y + 17 = 0$, $10x - y - 1$					

7 (a) Differentiate with respect to x

(i)
$$4x^2 + 5$$

(ii) $9x - x^3$.

(b) (i) Find
$$\frac{dy}{dx}$$
 when $y = \frac{2x-7}{x-1}, x \neq 1$.

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

(c) A car, starting at t = 0 seconds, travels a distance of s metres in t seconds where

$$= 30t - \frac{9}{4}t^2$$
.

(ii) After how many seconds is the speed of the car equal to zero?

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- (iii) Find the distance travelled by the car up to the time its speed is zero.
- 8 (a) Let p(x) = 3x 12. For what values of x is p(x) < 0 where x is a positive whole number?

(b) (i) Draw the graph of

$$g(x) = \frac{1}{x}$$
 for $-3 \le x \le 3$, $x \in \mathbf{R}$ and $x \ne 0$.

(ii) Using the same axes and the same scales, draw the graph of

$$h(x) = x + 1$$
 for $-3 \le x \le 3$, $x \in \mathbf{R}$

(iii) Use your graphs to estimate the values of x for which

$$\frac{1}{x} = x + 1.$$

- (c) Let $f(x) = x^3 3x^2 + ax + 1$ for all $x \in \mathbf{R}$ and for $a \in \mathbf{R}$.
 - f(x) has a turning point (a local maximum or a local minimum) at x = -1.
 - (i) Find the value of *a*.
 - (ii) Is this turning point a local maximum or a local minimum? Give a reason for your answer.
 - (iii) Find the co-ordinates of the other turning point of f(x).

Answers
7 (a) (i)
$$8x$$
 (ii) $9-3x^2$
(b) (i) $\frac{5}{(x-1)^2}$ (ii) $(6x+15)(x^2+5x-1)^2$
(c) (i) 21 ms^{-1} (ii) $\frac{20}{3} \text{ s}$ (iii) 100 m
8 (a) $\{1, 2, 3\}$
(b) (iii) $-1.6 < x < 0.6$
(c) (i) $a = -9$ (ii) $\frac{d^2y}{dx^2} = -12$ (iii) $(3, -26)$