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

2002

(ii) Differentiate $\frac{2x}{x-1}$ with respect to x and simplify your answer.

(c) A marble rolls along the top of a table. It starts to move at t = 0 seconds. The distance that it has travelled at *t* seconds is given by

 $s = 14t - t^2$

where *s* is in centimetres.

- (i) What distance has the marble travelled when t = 2 seconds?
- (ii) What is the speed of the marble when t = 5 seconds?
- (iii) When is the speed of the marble equal to zero?
- (iv) What is the acceleration of the marble?

| ANSWERS |
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| 6 | (a) -1 | | | |
|---|--------------------------------|----------------------------|-----------|-----------------------------|
| | (b) (i) $7(x-1)^6$; 7 | (ii) $5x^4 - 12x^2 - 6$ | бx | |
| | (c) (i) 12 | (ii) (2, -9), (-2, | 23) | |
| 7 | (a) $21x^2 - 6x + 9$ | | | |
| | (b) (i) $5x^4 - \frac{5}{x^6}$ | (ii) $-\frac{2}{(x-1)^2}$ | | |
| | (c) (i) 24 cm | (ii) 4 cm s^{-1} | (iii) 7 s | (iv) -2 cm s^{-2} |

- 8 Let $f(x) = \frac{1}{x+2}$.
 - (i) Find f(-6), f(-3), f(-1), f(0) and f(2).
 - (ii) For what real value of x is f(x) not defined?
 - (iii) Draw the graph of $f(x) = \frac{1}{x+2}$ for $-6 \le x \le 2$.
 - (iv) Find f'(x), the derivative of f(x).
 - (v) Find the two values of x at which the slope of the tangent to the graph is $-\frac{1}{9}$.
 - (vi) Show that there is no tangent to the graph of f that is parallel to the x-axis.

Answers 8 (i) -0.25, -1, 1, 0.5, 0.25 (ii) x = -2(iv) $-\frac{1}{(x+2)^2}$ (v) x = -5, 1