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

LESSON NO. 8: TURNING POINTS

2005

6 (c) Let $f(x) = x^2 + px + 10,\ x \in \mathbf{R}$, where $p \in \mathbf{Z}$.

(i) Find $f'(x)$, the derivative of $f(x)$.
(ii) The minimum value of $f(x)$ is at $x = 3$. Find the value of p.
(iii) Find the equation of the tangent to $f(x)$ at the point (0, 10).

2002

6 (c) Let $f(x) = x^3 - ax + 7$ for all $x \in \mathbf{R}$ and for $a \in \mathbf{R}$.

(i) The slope of the tangent to the curve $y = f(x)$ at $x = 1$ is -9.
Find the value of a.
(ii) Hence, find the co-ordinates of the local maximum point and the local minimum point on the curve $y = f(x)$.

2000

8 (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 $f(x)$.

1998

6 (c) $f(x) = (x+k)(x-2)^2$, where k is a real number.

(i) If $f(3) = 7$, find the value of k.
(ii) Using this value for k, find the coordinates of the local maximum and of the local minimum of $f(x)$.

1997

6 (c) Let $f(x) = ax^3 + bx + c$, for all $x \in \mathbf{R}$ and for $a, b, c \in \mathbf{R}$.

Use the information which follows to find the value of a, of b and of c:
(i) $f(0) = 3$
(ii) the slope of the tangent to the curve of $f(x)$ at $x = 1$ is -18
(iii) the curve of $f(x)$ has a local maximum at $x = 2$.

Answers

2005	6	(c) $2x + p$	(ii) $p = -6$	(iii) $6x + y - 10 = 0$
2002	6	(c) (i) 12	(ii) $(2, -9), (-2, 23)$	
2000	8	(c) (i) $a = -9$	(ii) Local maximum; $\frac{d^2y}{dx^2} = -12$	(iii) $(3, -26)$
1998	6	(c) (i) 4	(ii) $(2, 0), (-2, 32)$	
1997	6	(c) $a = 2$, $b = -24$, $c = 3$		