Differentiation & Functions (Q 6, 7 & 8, Paper 1)

Lesson No. 14: Reciprocal Graphs

2007

8 (c) Let $f(x) = \dfrac{1}{x+7}$, $x \in \mathbf{R}$, $x \neq -7$.

(i) Given that $f(k) = 1$, find k.

(ii) Find $f'(x)$, the derivative of $f(x)$.

(iii) Show that the curve $y = f(x)$ has no turning points.

2006

8 (c) Let $f(x) = \dfrac{1}{x-2}$, $x \in \mathbf{R}$, $x \neq 2$.

(i) Find $f'(x)$, the derivative of $f(x)$.

(ii) Find the values of x for which $f'(x) = -1$.

(iii) Find the co-ordinates of the two points on the curve $y = f(x)$ at which the slope of the tangent is -1.

2004

8 (c) Let $f(x) = \dfrac{1}{x+3}$, $x \in \mathbf{R}$, $x \neq -3$.

(i) Find $f'(x)$, the derivative of $f(x)$.

(ii) There are two points on the curve $y = f(x)$ at which the slope of the tangent is -1. Find the co-ordinates of these two points.

(iii) Show that no tangent to the curve $y = f(x)$ has a slope of 1.

2002

8 Let $f(x) = \dfrac{1}{x+2}$.

(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 $f(x) = \dfrac{1}{x+2}$ for $-6 \leq x \leq 2$.

(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.

2001

8 (c) Let $f(x) = \dfrac{1}{x+1}$ for $x \in \mathbf{R}$ and $x > -1$.

(i) Find $f'(x)$.

(ii) Find the co-ordinates of the point on the curve of $f(x)$ at which the tangent has slope of $-\frac{1}{4}$.

(iii) Find the equation of the tangent to the curve which has slope of $-\frac{1}{4}$.

1998

8 Let $f(x) = \dfrac{1}{x-1}$, for $x \in \mathbf{R}$ and $x \neq 1$.

(i) Find the value of $f(-2)$, $f(0)$, $f(\frac{3}{2})$ and $f(5)$.

(ii) Find $f'(x)$, the derivative of $f(x)$.

(iii) Draw the graph of $f(x)$ for $-2 \leq x \leq 5$.

(iv) Find the equation of the tangent T to the curve at the point $(0, -1)$.

(v) Find the coordinates of the other point on the graph of $f(x)$ at which the tangent to the curve is parallel to T.

ANSWERS

2007 8 (c) (i) $k = -6$ (ii) $f'(x) = -\dfrac{1}{(x+7)^2}$

2006 8 (c) (i) $-\dfrac{1}{(x-2)^2}$ (ii) $x = 1, 3$ (iii) $(1, -1), (3, 1)$

2004 8 (c) (i) $-\dfrac{1}{(x+3)^2}$ (ii) $(-2, 1), (-4, -1)$

2002 8 (i) $-0.25, -1, 1, 0.5, 0.25$ (ii) $x = -2$

(iv) $-\dfrac{1}{(x+2)^2}$ (v) $x = -5, 1$

2001 8 (c) (i) $-\dfrac{1}{(x+1)^2}$ (ii) $(1, \frac{1}{2})$ (iii) $x + 4y - 3 = 0$

1998 8 (i) $-\frac{1}{3}, -1, 2, \frac{1}{4}$ (ii) $-\dfrac{1}{(x-1)^2}$ (iv) $x + y + 1 = 0$

(v) $(2, 1)$