Geometrical applications of differentiation

The equation of the tangent (1)

QUESTION **1** Find the equation of the tangent to the curve:

a $y = 3x^4 - 7x^2 + 2$ at $(1, -2)$

b $y = x^2 + 2$ at the point where $x = -1$

c $y = (25 - x^2)^{\frac{1}{2}}$ at $(-4, 3)$

d $y = \frac{1}{x}$ at the point where $x = 2$

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The equation of the tangent (2)

QUESTION **1** At what point on the curve $y = 2x^2 - 7x + 5$ is the tangent parallel to the line $y = 5x - 2$?

QUESTION **2**

a Find the equation of the tangent to the curve $x^2 = 12y$ at $(6, 3)$

b At what point does this tangent cut the y-axis?

QUESTION **3**

a Find the equation of the tangent to the curve $y = x^2$ at $x = a$

b If this tangent cuts the y-axis at $(0, -9)$, find the two possible values of a.

Geometrical applications of differentiation

The equation of the normal (1)

QUESTION **1** Find the equation of the normal to the curve:

a $y = 3x^2$ at $(-1, 3)$

b $y = x^3 - 4x$ at the point where $x = 2$

c $y = \dfrac{1}{2x - 1}$ at $\left(2, \dfrac{1}{3}\right)$

d $y = \sqrt{x}$ at the point where $x = 4$

The equation of the normal (2)

QUESTION **1** Find the coordinates of the point on the curve $y = 8x - x^2$ where the normal is parallel to the line $x + 2y - 5 = 0$

QUESTION **2** The normal to the curve $y = \frac{1}{8}x^2$ at $P\left(2, \frac{1}{2}\right)$ meets the curve again at Q. Find the coordinates of Q.

Page 18 1 a $y = -2x$ b $y = -2x + 1$ c $4x - 3y + 25 = 0$ d $x + 4y - 4 = 0$

Page 19 1 (3, 2) 2 a $y = x - 3$ b (0, −3) 3 a $y = 2ax - a^2$ b $a = \pm 3$

Page 20 1 a $x - 6y + 19 = 0$ b $x + 8y - 2 = 0$ c $27x - 6y - 52 = 0$ d $4x + y - 18 = 0$

Page 21 1 (3, 15) 2 Q$\left(-18, 40\frac{1}{2}\right)$