



Grade Booster Paper - Tangents to Curves

FORMULAE LIST

Circle:

The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle centre $(-g, -f)$ and radius $\sqrt{g^2 + f^2 - c}$.

The equation $(x - a)^2 + (y - b)^2 = r^2$ represents a circle centre (a, b) and radius r .

Scalar Product:

$\mathbf{a} \cdot \mathbf{b} = |\mathbf{a}| |\mathbf{b}| \cos \theta$, where θ is the angle between \mathbf{a} and \mathbf{b}

or $\mathbf{a} \cdot \mathbf{b} = a_1 b_1 + a_2 b_2 + a_3 b_3$ where $\mathbf{a} = \begin{pmatrix} a_1 \\ a_2 \\ a_3 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \end{pmatrix}$.

Trigonometric formulae:

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 2 \cos^2 A - 1$$

$$= 1 - 2 \sin^2 A$$

Table of standard derivatives:

$f(x)$	$f'(x)$
$\sin ax$	$a \cos ax$
$\cos ax$	$-a \sin ax$

Table of standard integrals:

$f(x)$	$\int f(x) dx$
$\sin ax$	$-\frac{1}{a} \cos ax + c$
$\cos ax$	$\frac{1}{a} \sin ax + c$

Tangents to Curves

Equations of a tangent to a curve		
1.	Find the equation of the tangent to the curve $y = x^3 - 4x^2 + 2x - 1$ at point P where $x = 2$	5
2.	Find the equation of the tangent to the parabola $y = 4x - x^2$ at the origin (0,0)	4
3.	Find the equation of the tangent to the curve $y = 5x^2 + 2$ at the point (-1, 7)	4
4.	Find the equation of the tangent to the parabola $y = 4x^3 - 2$ at the point where $x = -1$	5
5.	Find the equation of the tangent to the curve $y = (2x - 1)^3$ at the point (1,1)	5

Answers

Equations of a tangent to a curve - Answers		
1	Know to differentiate $\frac{dy}{dx} =$ Differentiate the function $3x^2 - 8x + 2$ Find the gradient of the tangent by substituting $x = 2$ into the derivative $m = -2$ Find the y coordinate of P by substituting into the original curve $y = -5$ Find the equation of the tangent $y + 5 = -2(x - 2)$ Or $y = -2x - 1$	
2	Know to differentiate $\frac{dy}{dx} =$ Differentiate the function $4 - 2x$ Find the gradient of the tangent by substituting $x = 0$ into the derivative $m = 4$ Find the equation of the tangent $y + 0 = 4(x - 0)$ Or $y = 4$	
3	Know to differentiate $\frac{dy}{dx} =$ Differentiate the function $10x$ Find the gradient of the tangent by substituting $x = -1$ into the derivative $m = -10$ Find the equation of the tangent $y - 7 = -10(x + 1)$ Or $y = -10x - 3$	
4	Know to differentiate $\frac{dy}{dx} =$ Differentiate the function $12x^2$ Find the gradient of the tangent by substituting $x = -1$ into the derivative $m = -12$ Find the y coordinate of the point by substituting into the original curve $y = -6$ Find the equation of the tangent $y + 6 = -12(x + 1)$ Or $y = -12x - 18$	
5	Know to differentiate $\frac{dy}{dx} =$ Differentiate the composite function $3(2x - 1)^2 \times 2 = 6(2x - 1)^2$ Find the gradient of the tangent by substituting $x = 1$ into the derivative $m = 6$ Find the equation of the tangent $y - 1 = 6(x - 1)$ Or $y = 6x - 5$	