



Non-Calculator Whole Booklet - 40 Questions

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:

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

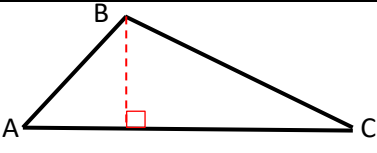
Answers

Sheet A - Solutions	
Non-Calculator Question	Answer
1) State the equation used to find the distance between 2 points.	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
2) How do you prove lines are perpendicular?	$m_1 \times m_2 = -1$
3) In a recurrence relation, how do you know a limit exists?	$-1 < a < 1$
4) If $f(x) = \frac{1}{x-2}$, find $f^{-1}(x)$.	$f^{-1}(x) = \frac{1}{x} + 2$
5) Prove (x-1) is a factor of $f(x) = x^3 + 5x^2 + 2x - 8$	<i>remainder = 0</i>
6) If $\sin x = \frac{6}{10}$, find $\cos 2x$.	$\cos 2x = \frac{7}{25}$
7) Find $\int_0^2 3x^2 - 2x + 5 dx$.	14
8) Given an angle a straight line makes with the positive direction of the x axis, state an equation that can be used to find the gradient of the line.	$m = \tan \theta$
9) Write the following in degrees: a) $\frac{\pi}{6}$ b) $\frac{2\pi}{3}$ c) $\frac{5\pi}{4}$	a) 30° b) 120° c) 235°
10) State the centre and the radius of the following circle: $x^2 + y^2 - 4x + 6y + 11 = 0$	<i>centre (2, -3) radius = $\sqrt{2}$</i>

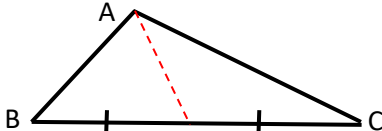
Sheet B - Solutions

Non-Calculator Question	Answer
1) State the equation used to find the midpoint between 2 points.	$mp = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right)$
2) How do you prove lines are parallel?	$m_1 = m_2$
3) What is the formula used to calculate the limit of a recurrence relation?	$L = \frac{b}{1 - a}$
4) If $f(x) = x + 5$ and $g(x) = x^2$ Find $g(f(x))$.	$g(f(x)) = (x + 5)^2$ $g(f(x)) = x^2 + 10x + 25$
5) $u_{n+1} = 0.5u_n - 3$ $u_0 = 4$ Find u_2 .	$u_2 = -\frac{7}{2}$
6) Find $\int \frac{x^2+5x}{x} dx$.	$\frac{1}{2}x^2 + 5x + C$
7) If $\tan x = \frac{5}{7}$, find $\sin 2x$.	$\sin 2x = \frac{35}{37}$
8) State the centre and the radius of the following circle: $(x - 3)^2 + (y + 2)^2 = 36$	$\text{centre } (3, -2) \quad \text{radius} = 6$
9) Express $2x^2 + 16x + 5$ in the form $a(x + p)^2 + q$.	$2(x + 4)^2 - 27$
10) If $y = 3x^3 - 5x^2 + 4x$, find $\frac{dy}{dx}$.	$\frac{dy}{dx} = 9x^2 - 10x + 4$

Sheet C - Solutions

Non-Calculator Question	Answer
1) Sketch a triangle (ABC) with an altitude drawn from B.	
2) How can you tell if a function is increasing at a particular point?	$\frac{dy}{dx} > 0$
3) If the graph of $f(x)$ has a point $(2,-5)$, what will this transform to in the equation $2 - f(x)$?	$(2,7)$
4) Solve the equation $\cos 2x = 4\cos x + 5$.	$x = 180^\circ \text{ or } \pi \text{ radians}$
5) Find $\int \sqrt{x} + 3x^2 dx$.	$\frac{2}{3}\sqrt{x^3} + x^3 + C$
6) A circle has centre $C(4,5)$ and a goes through the point $(8,5)$. State the equation of the circle.	$(x - 4)^2 + (y - 5)^2 = 16$
7) Calculate the limit of the following recurrence relation: $u_{n+1} = \frac{1}{4}u_n + 6$.	$L = 8$
8) Find the x co-ordinate of the stationary point on the curve $y = 2x^2 + 3x$ and determine its nature.	$\min TP \text{ at } x = -\frac{3}{4}$
9) Express $3x^2 - 24x + 2$ in the form $a(x + p)^2 + q$.	$3(x - 4)^2 - 46$
10) Determine whether $(x - 4)$ is a factor of $f(x) = 2x^3 - 9x^2 - 5x + 4$.	$\text{no, since } r = -32$

Sheet D - Solutions

Non-Calculator Question	Answer
1) Sketch a triangle (ABC) with a median drawn from A.	
2) How can you tell if a function is stationary at a particular point?	$\frac{dy}{dx} = 0$
3) If the graph of $f(x)$ has a point (2,3), what will this transform to in the equation $3 - f(x)$?	$(2,0)$
4) Solve the equation $2\sin 2x = 5\sin x$ for $0 \leq x \leq 360$.	$x = 0^\circ, 180^\circ, 360^\circ$
5) Calculate the limit of the following recurrence relation: $u_{n+1} = 0.2u_n + 4$.	$L = 5$
6) Find the gradient of the tangent to the curve $y = 3x^3 + 2x^2$ when $x = 2$.	$m = 44$
7) A circle has the equation $(x - 2)^2 + (y - 5)^2 = 5$ Find the equation of the tangent at the point (3,7).	$x + 2y - 17 = 0$
8) If $f(x) = 3x + 2$ and $g(x) = \frac{1}{x^2}$, Find $g(f(x))$.	$g(f(x)) = \frac{1}{(3x + 2)^2}$ $g(f(x)) = \frac{1}{9x^2 + 12x + 4}$
9) A circle has centre (-2,-5) and radius 5. State the equation of the circle.	$(x + 2)^2 + (y + 5)^2 = 25$
10) Find $\int_0^4 -x^3 + 2x \, dx$.	-48