MTM315117
MATHEMATICS METHODS - FOUNDATION

EXTERNAL ASSESSMENT INFORMATION SHEET

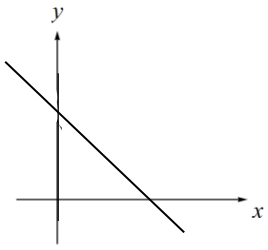
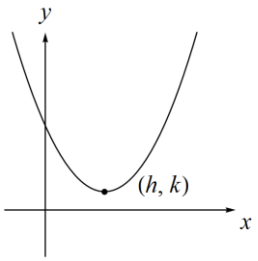
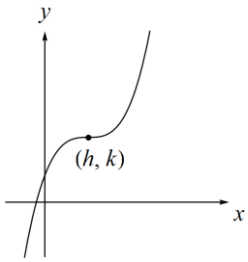
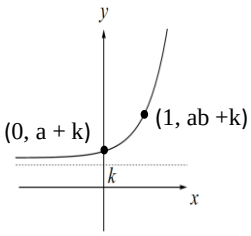
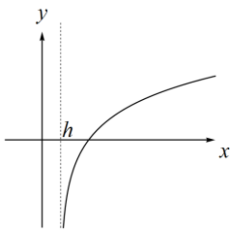
ALGEBRA & FUNCTION STUDY

Gradient: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$ Point - gradient formula $y - y_1 = m(x - x_1)$

Sum and Difference of cubes $x^3 + y^3 = (x+y)(x^2 - xy + y^2)$ $x^3 - y^3 = (x-y)(x^2 + xy + y^2)$

Quadratic Formula: If $ax^2 + bx + c = 0$ Then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ where $\Delta = b^2 - 4ac$

Graph Shapes:

Linear	Quadratic	Cubic
$y = mx + c$	$y = a(x-h)^2 + k$	$y = a(x-h)^3 + k$
		
Exponential	**Logarithmic**	
$y = a \times b^x + k$	$y = a \log_n(x-h) + k$	
		

Gradient of normal = $-\dfrac{1}{m}$

Graphical Transformations:

$y = -f(x)$ is a reflection of the graph of $y = f(x)$ in the x axis

$y = f(-x)$ is a reflection of the graph of $y = f(x)$ in the y axis

$y = a f(x)$ is a dilation of the graph of $y = f(x)$ by factor a in the direction of the y axis

$y = f(ax)$ is a dilation of the graph of $y = f(x)$ by factor $\dfrac{1}{a}$ in the direction of the x axis

$y = f(x+h)$ is a translation of the graph of $y = f(x)$ by h units to the left

$y = f(x) + k$ is a translation of the graph of $y = f(x)$ by k units upwards

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Index Laws	Useful Log Results	Log Laws
$a^m \times a^n = a^{m+n}$	**Definition:** If $y = a^n$, $\log_a y = n$	$\log_a m + \log_a n = \log_a mn$
$a^m \div a^n = a^{m-n}$	$\log_a 1 = 0$	$\log_a m - \log_a n = \log_a \left(\frac{m}{n}\right)$
$\left(a^m\right)^n = a^{mn}$		$\log_a m^p = p \log_a m$
$a^0 = 1$	$\log_a a = 1$	$\log_b n = \frac{\log_a n}{\log_a b}$
$a^{-n} = \frac{1}{a^n}$		
$(a)^{\frac{1}{n}} = \sqrt[n]{a}$ and $(a)^{\frac{m}{n}} = \sqrt[n]{a^m}$		

Pascal's Triangle

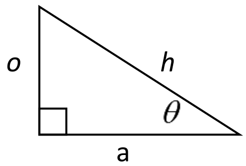
1	1
1 1	$x \pm y$
1 2 1	$x^2 \pm 2xy + y^2$
1 3 3 1	$x^3 \pm 3x^2y + 3xy^2 \pm y^3$

Binomial Expansion

$$(x+y)^n = {}^nC_0 x^n + {}^nC_1 x^{n-1}y + {}^nC_2 x^{n-2}y^2 + \ldots + {}^nC_{n-1} x y^{n-1} + {}^nC_n y^n$$

TRIGONOMETRY

Right Angle Trigonometry:



$\sin\ \theta = \frac{o}{h}$ $\cos\ \theta = \frac{a}{h}$ $\tan\ \theta = \frac{o}{a}$

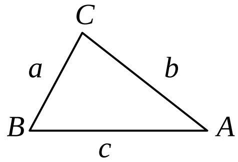
Non Right Angle Trigonometry:

Sine Rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine Rule

$$a^2 = b^2 + c^2 - 2bc\cos A \qquad \cos A = \frac{b^2 + c^2 - a^2}{2bc}$$



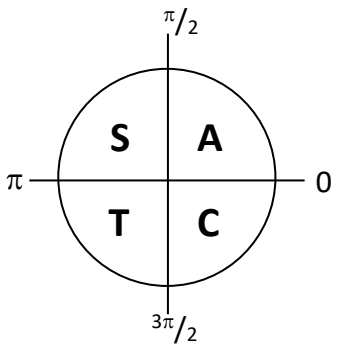
Conversion: Radians to degrees: multiply by $\frac{180}{\pi}$ Degrees to radians: multiply by $\frac{\pi}{180}$

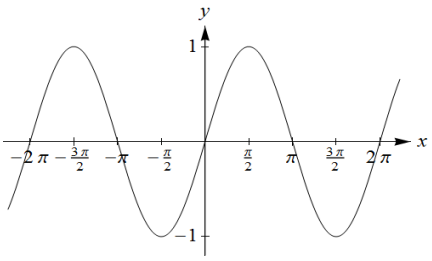
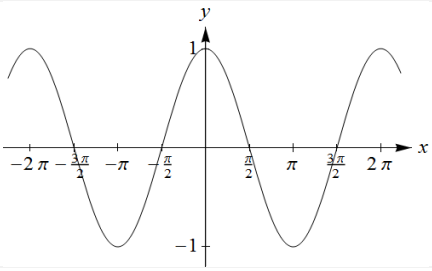
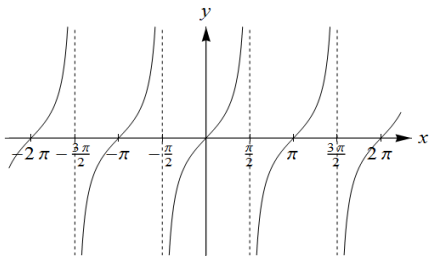
Basic Identities: $\sin^2 x + \cos^2 x = 1$ $\tan\ x = \frac{\sin x}{\cos x}$

Exact Values

x	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
$\sin x$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
$\cos x$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0	-1	0	1
$\tan x$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undefined	0	undefined	0

CAST DIAGRAM

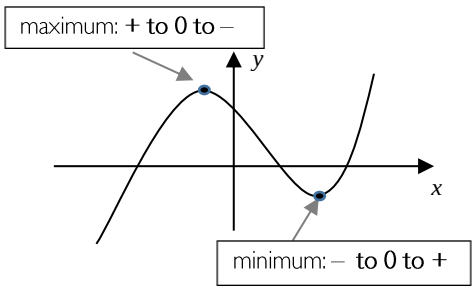


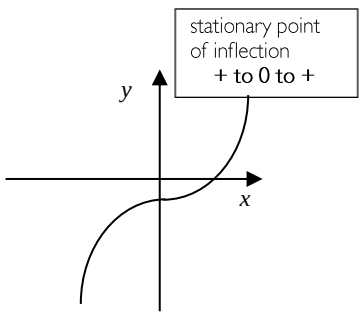
$y = \sin x$	$y = \cos x$	$y = \tan x$
		
$y = a\sin nx$ or $y = a\cos nx$		$y = \tan nx$ then period $= \frac{\pi}{n}$
amplitude $= \lvert a \rvert$ period $= \frac{2\pi}{n}$		(FIRST asymptote, solve $nx = \pi/2$)

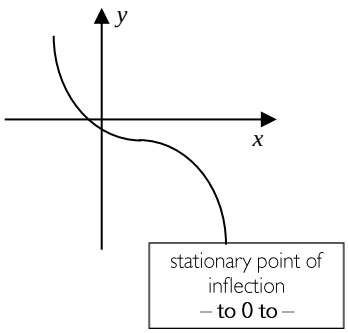
CALCULUS

Definition of Derivative:	$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$
Differentiation:	If $f(x) = kx^n$ then $f'(x) = nkx^{n-1}$ OR If $y = kx^n$ then $\frac{d}{dx}(kx^n) = nkx^{n-1}$

Nature of stationary points (and 'change in the sign' of the gradient):



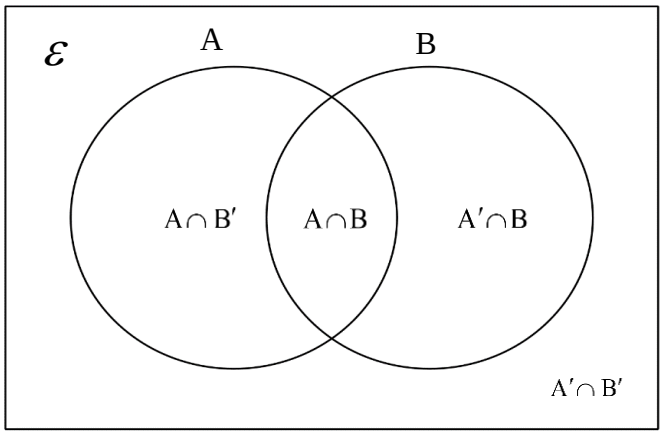




PROBABILITY

Calculating Probability: $\Pr(E) = \dfrac{n(E)}{n(\varepsilon)}$

Venn diagrams:



Addition rule: $\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$

Conditional probability: $\Pr(A|B) = \dfrac{\Pr(A \cap B)}{\Pr(B)}$

Independent events: $\Pr(A \cap B) = \Pr(A) \times \Pr(B)$ as $\Pr(B|A) = \Pr(B)$

Combinations: ${}^{n}C_{r} = \dfrac{n!}{r!(n-r)!}$ Where $n! = n(n-1)(n-2)\cdots 3 \times 2 \times 1$