A2 Mathematics: Revision Questions 1

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Differentiation

$$\frac{d}{dx}(\sin x) =$$
$$\frac{d}{dx}(\cos x) =$$
$$\frac{d}{dx}(\tan x) =$$
$$\frac{d}{dx}(\operatorname{cosec} x) =$$
$$\frac{d}{dx}(\sec x) =$$
$$\frac{d}{dx}(\cot x) =$$

$$\begin{aligned}
\frac{d}{dx}(\sin x) &= \cos x \\
\frac{d}{dx}(\cos x) &= \\
\frac{d}{dx}(\tan x) &= \\
\frac{d}{dx}(\operatorname{cosec} x) &= \\
\frac{d}{dx}(\sec x) &= \\
\frac{d}{dx}(\cot x) &=
\end{aligned}$$

Differentiation

$$\frac{d}{dx}(\sin x) = \cos x$$
$$\frac{d}{dx}(\cos x) = -\sin x$$
$$\frac{d}{dx}(\tan x) =$$
$$\frac{d}{dx}(\operatorname{cosec} x) =$$
$$\frac{d}{dx}(\sec x) =$$
$$\frac{d}{dx}(\cot x) =$$

Differentiation

$$\begin{aligned}
\frac{d}{dx}(\sin x) &= \cos x \\
\frac{d}{dx}(\cos x) &= -\sin x \\
\frac{d}{dx}(\tan x) &= \sec^2 x \\
\frac{d}{dx}(\operatorname{cosec} x) &= \\
\frac{d}{dx}(\sec x) &= \\
\frac{d}{dx}(\cot x) &=
\end{aligned}$$

Differentiation

$$\frac{d}{dx}(\sin x) = \cos x$$

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$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cot x$$

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\frac{d}{dx}(\sin x) &= \cos x \\
\frac{d}{dx}(\cos x) &= -\sin x \\
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\frac{d}{dx}(\operatorname{cosec} x) &= -\operatorname{cosec} x \cot x \\
\frac{d}{dx}(\sec x) &= \sec x \tan x \\
\frac{d}{dx}(\cot x) &= -\operatorname{cosec}^2 x
\end{aligned}
$$

Exact Values

	0°	30°	45°	60°	90°
sin					
cos					
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0				
cos					
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$			
cos					
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$		
cos					
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	
cos					
tan					

Exact Values

	$0°$	$30°$	$45°$	$60°$	$90°$
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos					
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1				
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$			
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$		
tan					

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	
tan					

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	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan					

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	0°	30°	45°	60°	90°
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tan	0				

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	0°	30°	45°	60°	90°
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cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$			

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1		

Exact Values

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	

Exact Values

	$0°$	$30°$	$45°$	$60°$	$90°$
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	—

$$17^2 =$$

Squares and Cubes

$$17^2 = 289$$

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$$17^2 = 289 \qquad 7^3 =$$

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$$17^2 = 289 \qquad 7^3 = 343$$

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$$19^2 =$$

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$$11^2 =$$

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$$11^2 = 121 \qquad 9^3 = 729$$

Modelling Assumptions

In what circumstances can we model an object as a particle?

What does it mean for a string to be inextensible?

What does it mean for a pulley to be modelled as smooth?

In what circumstances can we model an object as a particle?
When the object is small in comparison with the other sizes or lengths involved.

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It does not stretch under a load.

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Modelling Assumptions

In what circumstances can we model an object as a particle?
When the object is small in comparison with the other sizes or lengths involved.

What does it mean for a string to be inextensible?
It does not stretch under a load.

What does it mean for a pulley to be modelled as smooth?
There is no friction at the bearing of the pulley.

Newton's Laws of Motion

What is Newton's First Law?

What is Newton's Second Law?

What is Newton's Third Law?

Newton's Laws of Motion

What is Newton's First Law?

An object will stay at rest or will move in a straight line at a constant velocity unless acted upon by an unbalanced force.

What is Newton's Second Law?

What is Newton's Third Law?

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An object will stay at rest or will move in a straight line at a constant velocity unless acted upon by an unbalanced force.

What is Newton's Second Law?
$F = ma$ where F is the resultant force, m is the mass, and a is the acceleration.

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What is Newton's First Law?

An object will stay at rest or will move in a straight line at a constant velocity unless acted upon by an unbalanced force.

What is Newton's Second Law?

$F = ma$ where F is the resultant force, m is the mass, and a is the acceleration.

What is Newton's Third Law?

For every action there is an equal and opposite reaction.

Functions

What is a mapping?

What is a function?

What property does a function need to have for it to have an inverse?

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What is a function?
A function is a mapping where every element of the domain is mapped to exactly one element of the range.

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A mapping is a transformation of one set of numbers into a (possibly different) set of numbers.

What is a function?

A function is a mapping where every element of the domain is mapped to exactly one element of the range.

What property does a function need to have for it to have an inverse?

The function needs to be one-to-one (bijective).

State the domain and range for the following three inverse trigonometric functions. Give your answers in radians.

Function	**Domain**	**Range**
$\sin^{-1} x$		
$\cos^{-1} x$		
$\tan^{-1} x$		

State the domain and range for the following three inverse trigonometric functions. Give your answers in radians.

Function	**Domain**	**Range**
$\sin^{-1} x$	$-1 \leqslant x \leqslant 1$	
$\cos^{-1} x$		
$\tan^{-1} x$		

State the domain and range for the following three inverse trigonometric functions. Give your answers in radians.

Function	**Domain**	**Range**
$\sin^{-1} x$	$-1 \leqslant x \leqslant 1$	$-\frac{\pi}{2} \leqslant x \leqslant \frac{\pi}{2}$
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$\cos^{-1} x$	$-1 \leqslant x \leqslant 1$	
$\tan^{-1} x$		

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$\cos^{-1} x$	$-1 \leqslant x \leqslant 1$	$0 \leqslant x \leqslant \pi$
$\tan^{-1} x$		

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$\tan^{-1} x$	$-\infty < x < \infty$	

State the domain and range for the following three inverse trigonometric functions. Give your answers in radians.

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$\cos^{-1} x$	$-1 \leqslant x \leqslant 1$	$0 \leqslant x \leqslant \pi$
$\tan^{-1} x$	$-\infty < x < \infty$	$-\frac{\pi}{2} < x < \frac{\pi}{2}$

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(2x)$?

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = |\mathrm{f}(x)|$?

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(|x|)$?

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(2x)$?
Horizontal stretch, scale factor $\frac{1}{2}$.

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = |\mathrm{f}(x)|$?

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Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(2x)$?
Horizontal stretch, scale factor $\frac{1}{2}$.

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = |\mathrm{f}(x)|$?
Reflect any part of the graph that is below the x-axis in the x-axis and leave the rest of the graph alone.

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(|x|)$?

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(2x)$?
Horizontal stretch, scale factor $\frac{1}{2}$.

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Reflect any part of the graph that is below the x-axis in the x-axis and leave the rest of the graph alone.

Given the graph of $y = \mathrm{f}(x)$ how can you draw the graph of $y = \mathrm{f}(|x|)$?
Discard the part of the graph to the left of the y-axis and reflect the rest of the graph in the y-axis.