

Differentiation rules

Derivative

$$y' \qquad \frac{dy}{dx} \qquad f'(x)$$

Slope of the curve Slope of the tangent line Rate of change

Put power down, Power – 1



6.2	Derivative of x^n	$f(x) = x^n \implies f'(x) = nx^{n-1}$
	Derivative of sin x	$f(x) = \sin x \implies f'(x) = \cos x$
	Derivative of $\cos x$	$f(x) = \cos x \implies f'(x) = -\sin x$
	Derivative of tan x	$f(x) = \tan x \implies f'(x) = \frac{1}{\cos^2 x}$
	Derivative of e ^x	$f(x) = e^x \implies f'(x) = e^x$
	Derivative of $\ln x$	$f(x) = \ln x \implies f'(x) = \frac{1}{x}$
	Chain rule	$y = g(u), u = f(x) \implies \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
	Product rule	$y = uv \implies \frac{\mathrm{d}y}{\mathrm{d}x} = u\frac{\mathrm{d}v}{\mathrm{d}x} + v\frac{\mathrm{d}u}{\mathrm{d}x}$
	Quotient rule	$y = \frac{u}{v} \implies \frac{\mathrm{d}y}{\mathrm{d}x} = \frac{v\frac{\mathrm{d}u}{\mathrm{d}x} - u\frac{\mathrm{d}v}{\mathrm{d}x}}{v^2}$



Simple differentiation

Find the derivative of the following functions.

1. y = 4x			
2. $y = 5x^3$			
$3. y = 10\sqrt{x}$;		
4. <i>y</i> = 20			



5.
$$y = \frac{9}{x^3}$$

6. y	=5x	$^{3} + 4$	x - 29

7.
$$y = 2(3x - 2)$$

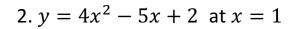
$$8. y = \frac{4}{3}x^6 + 5x^2 + 2x$$

9.
$$y = \frac{1}{3x^3} - 2x^2 - 5$$



Find the gradient of the curve

1.
$$y = 10x^3$$
 at $x = 2$



3.
$$y = \frac{3}{x^3} - 2x$$
 at $x = 3$

$$4. y = \frac{3}{\sqrt{x}} - 2x$$

at
$$x = 2$$



5. $y = (x+3)^3$ at $x = -2$		



Chain rule

Find y' of the following functions

$1. y = (5x - 2)^3$		
$2. y = 6(x^2 + 3x - 4)^2$		

$3. y = \frac{5}{4x - x^2}$			



4. v	, _	8
4. <i>y</i>	<i>–</i>	$(9x+3)^2$

$5. y = \sqrt{x^2 + 3}$			



Paper 1

- 1. Consider $f(x) = x^2 \sin x$.
- (a) Find f'(x).
- (b) Find the gradient of the curve of f at $x = \frac{\pi}{2}$.



- 2. Given that $f(x) = \frac{1}{x}$, answer the following.

(a) Find the first(b) Write an expi			nd n.	
	,			