Week 1&2
Term 1
2020

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Learning Brief MM3:
Further differentiation and applications

Goals

This week we are:

- Reviewing rate of change, gradient and key features of graphs
- Reviewing differentiation using power rule
- Learn and use the chain rule for differentiation
- Find the derivatives of exponential functions of the forms: $y = e^x$, and $y = e^{f(x)}$
- Use the CAS to find the derivatives of exponential functions
- Use derivatives to solve practical problems

Theoretical Components

STEP 1

Resources:

- Maths Quest Year 12 Chapter 7

Chain Rule Proof

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

https://www.khanacademy.org/math/ap-calculus-ab/product-quotient-chain-rules-ab/chain-rule-proof-ab/v/chain-rule-proof

Read and make notes examples 13, 14 and 15 from Chapter 7

What is base e?
Read through to get an insight on the number 'e':
http://bit.ly/w8OiD

http://www.mathopolis.com/questions/q.php?id=2011&site=1&ref=/numbers/e-eulers-number.html&qs=2011_2012_2013

Derivative of $y = e^x$, and $y = e^{f(x)}$ from first principles
See the following page

Read and make notes examples 16 - 19 from Chapter 7

Practical Components

STEP 2

10 Quick Questions on mathspace

http://mathspace.co/student/tasks/AdaptiveTask-778431/

The Chain Rule
Exercise 7D: Q1,Q2,Q4,Q5,Q6,
Q7e,d,f,h, Q8, Q10c,d, Q13,Q16,Q17,Q18

The Derivative of e^x and $e^{f(x)}$
Exercise 7E: Q1 g,h,f Q2 j,k,l Q3,Q4,Q5,m,n Q6,Q7,Q8,Q9

If you need to remind yourself of exponential functions and their graphs review:
https://mathspace.co/learn/ac-methods-12/calculus-of-exponential-functions-3232/

Investigation

STEP 3
See next page

QFO
Quiz/Forum/Other

Review quiz, same as above
http://mathspace.co/student/tasks/AdaptiveTask-778431/

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Week 1&2 Investigation

Parametric Differentiation: In many later situations, a curve will be specified by two equations giving x and y in terms of some third variable t, called a *parameter*. For example,

$$x = 2t, \qquad y = t^2$$

specifies the parabola $y = \frac{1}{4}x^2$, as can be seen by eliminating t from the two equations. In this situation it is very simple to calculate dy/dx directly using *parametric differentiation*. The formula below is another version of the chain rule, because 'the dt's just cancel out'.

13 PARAMETRIC FUNCTIONS: $\dfrac{dy}{dx} = \dfrac{dy/dt}{dx/dt}$

WORKED EXERCISE: In the example above, $\dfrac{dy}{dx} = \dfrac{2t}{2}$

$= t.$

Question for you:

Now, if $x = \frac{1}{\sqrt{5t^2-2t}}$ and $y = e^{2t^2} - e^{-7}$.

Calculate $\frac{dy}{dx}$ using the method above. Give your answer in the simplest form.

(20 marks)