

MATHEMATICS DEPARTMENT

Year 12 Methods - Test Number 1 - 2017

Differentiation of Exponential and Trigonometric Functions

Resource Free



Name: _____

Marks: 18

Time Allowed: 20 minutes

Instructions: You are NOT allowed any Calculators or notes.

You will be supplied with a formula sheet.

1. Find $\frac{dy}{dx}$ for

a) $y = \frac{16e^x}{4e^{5x}}$

b) $y = 2\sin(e^{2x})$

c) $y = 3x^2 e^{2x}$ [simplify your answer]

[2,4 = 6 marks]

****End of Test****

d) $y = 3\pi \tan(1+e)^2$

[3,3,3,3 = 12 Marks]

2. Find the equation of the tangent to the curve defined by $h = (e^{2t})(e^t + 1)^2$ at the point (0,4).

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[6 Marks]

Resource Rich



[3,3 = 6 marks]

- 4) The displacement, x cm, of a particle from a fixed point O , t seconds after it is released is modelled by the equation $x = -5\cos\frac{\pi t}{4}$. Use a calculus method to determine:
- a) The velocity of the particle after 2 seconds,

- b) When during the interval $0 \leq t \leq 8$, the particle travels with a speed of 1 cm s^{-1} .

Instructions: You are allowed a ClassPad and 1 page of notes (both sides).
You will be supplied with a formula sheet.

Marks: 26
Time Allowed: 25 minutes

Name: _____ Teacher: _____

- 1) It is known that the amount of a dangerous 'recreational drug' (in mg) left unabsorbed in the bloodstream after t hours is given by $U = 100e^{-0.05t}$
- a) Show that the rate of change of U with respect to time is proportional to the amount of the drug remaining.

- b) Find the time taken for 90% of the initial amount of the drug to be absorbed by the bloodstream. Give your answer to the nearest hour.

[4,4 = 8 Marks]

- c) Find an expression that describes the amount of the drug absorbed by the bloodstream after t hours.

[3,2,1 = 6 Marks]

- 2) a) The normal to a given curve at a point is defined as the perpendicular to the tangent at that

point. Find the equation of the normal to the curve $y = \frac{e^x}{2-x}$ at the point where $x = 1$.

- b) $y = x + 1$ is a tangent to the curve $y = ax + b \sin x$ at the point $(\frac{\pi}{2}, 1 + \frac{\pi}{2})$. Find a and b .

- 3) Fishermen monitored the growth of the population of sardines in a particular location over a 30 year period from 1985 when the population was estimated to be 2 000 000 . They found that the population was continuously growing with the instantaneous rate of increase in the population

per year $\frac{dP}{dt}$, always close to $\frac{P}{20}$.

- a) Estimate the population of sardines at the end of the 30 year period.

- b) If this pattern of growth continues estimate the population of sardines in 2040.