NAME: _____

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KNOW / 12	APP / 12	INQ / 12	COMM / 6

MCV4U1 - UNIT 5 – DERIVATIVES OF EXPONENTIAL AND TRIGONOMETRIC FUNCTIONS

TEST

ROUND ALL ANSWERS TO THE NEAREST HUNDREDTH UNLESS OTHERWISE STATED

1) Differentiate each of the following and factor/simplify your answer as much as possible. (*K – 2, 2, 3, 3 marks*)

a) $f(x) = e^{\sin 3x}$

b) $f(x) = \cos\left(e^x + x^2\right)$

c) $f(x) = 3^{x^2}\cos(2x)$

d) $f(x) = \dfrac{\tan\left(x^2\right)}{3^x}$

2) Determine, to the nearest hundredth, the slope of the tangent to $y = 5^{\cos x}$ where $x = \dfrac{\pi}{4}$. (*K – 2 marks*)

3) Determine, to two decimal places, the coordinates of all local maximum and local minimum points for the function $f(x)=\dfrac{-2x^2-7x+13}{e^x}$. For each point, be sure to state whether it is a maximum or minimum that occurs. (*A - 4 marks*)

4) Find the equation of the tangent line to $f(x)=x^2\sin x$ at the point where $x=\dfrac{\pi}{2}$. Leave all values *in exact form.* (*A - 4 marks*)

5) Consider the function $f(x) = e^x \sin x$.

a) Find $f''(x)$. (*A – 2 marks*)

b) Determine the 20th derivative, $f^{20}(x)$, of *f*(*x*). (Hint: It is not necessary to actually differentiate 20 times!) (*A – 2 marks*)

6) The number of rabbits in a forest is given by $N(t) = 30000\left(2^{-0.2t}\right)$, were *t* represents time in years and *N* represents the number of rabbits.

a) Determine when the population will reach 10000. (*I – 3 marks*)

b) Find, to the nearest tenth, the rate of change of the rabbit population after 3 years. (*I – 3 marks*)

7) A garage that is 3 m high is built against a very tall wall. The garage extends 4.5 m from the wall. Find, to the nearest hundredth of a meter, the length of the shortest ladder that can lean against the garage and touch the wall. (*I – 6 marks*)

8) Find the derivative of $y = \csc x$. Express your answer using only reciprocal trigonometric ratios (secant, cosecant and cotangent). (*C – 3 marks*)

9) Bobby finds the derivative of a function and obtains the result $y' = e^x e^{-x^2}(x^2+1)(x-1)(\sin x + 5)$. He claims there is only one critical number, $x = 1$. Explain how Bobby is able to immediately arrive at such a conclusion. *(C – 3 marks)*