Serial No.:_____ Student Name:_____ Student Number: _____

Instructor: M. Z. Abu-Sbeih Math 101- Q3 Date: 22-10-2019

SHOW ALL YOUR WORK. NO CREDITS FOR ANSWERES WITHOUT JUSTIFICATIONS

Problem 1: (7 points) Find all values of *a* and *b* so that the line $2x + y = b$ is tangent to the parabola $y = a x^2$ at $x = 2$.

Problem 2: (7 points) Find the limit: $\lim_{x \to 1} \dfrac{\tan(x-1)}{x^2-1}$

Problem 3: (7 points) Find the equation of the line tangent to the curve $\sin(x^2 - y^2) + 3xy = 3$ at the point (1, 1)

Problem 4: (7 points) Find the equation of the line tangent to the curve $\cos(x^2 - y^2 + \dfrac{\pi}{2}) + 2xy = 2$ at the point (1, 1)

Problem 5: (7 points) If $f(x) = (\sin x + \cos x)^2$, find $f^{(99)}(0)$.

Problem 6: (7 points) Find all points on the curve $f(x) = 2\tan^{-1}(e^x)$ where the tangent line has slope 1.

Problem 7: (7 points) If $f(x) = \tan^{-1}(\cot x)$ find $f'(\dfrac{\pi}{3})$

Problem 8: (12 points) Find y' (DO NOT SIMPLIFY)

(i) $y = \left(\dfrac{\sec x}{1 + \cot x} \right)^5$

(ii) $y = \sin^2(\tan^3(x^5))$