



Bilkent University

Quiz # 03
Math 101-Section 05 Calculus I
12 October 2023 Thursday
Instructor: Ali Sinan Sertöz
Solution Key

Q-1)

- (a) Let $f(x) = \sin(\cos^2[(x^2 + 1)^7])$. Calculate $f'(x)$. Do not simplify!
- (b) Let y be a differentiable function of x satisfying $x^4 + y^7 + xy + 1 = 20y^3$. Write an equation for the tangent line of the curve defined by this equation at the point $(x, y) = (2, 1)$

Show your work in detail unless asked otherwise. Correct answers without detailed explanation do not get any credit.

Grading: 5+5=10

Solution:

(a)

$$f'(x) = \cos(\cos^2[(x^2 + 1)^7]) \cdot 2 \cos[(x^2 + 1)^7] \cdot (-\sin[(x^2 + 1)^7]) \cdot (7(x^2 + 1)^6) \cdot (2x).$$

(b) Implicitly differentiating the given equation we get

$$4x^3 + 7y^6 y' + y + x y' = 60y^2 y'.$$

Putting in $x = 2$ and $y = 1$ we find that $y' = 11/17$.

Hence an equation for the tangent line at $(2, 1)$ is

$$y = \frac{11}{17}(x - 2) + 1.$$