



Bilkent University

Quiz # 03
Math 101-Section 04 Calculus I
12 October 2023 Thursday
Instructor: Ali Sinan Sertöz
Solution Key

Q-1)

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

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

Grading: 5+5=10

Solution:

(a)

$$f'(x) = 2 \tan[(x^3 - 7x^2 + 1)^4] \cdot \sec^2[(x^3 - 7x^2 + 1)^4] \cdot (4(x^3 - 7x^2 + 1)^3) \cdot (3x^2 - 14x).$$

(b) Implicitly differentiating the given equation we get

$$3x^2 + 3y^2 y' + 2xy + x^2 y' = 6y y'.$$

Putting in $x = 1$ and $y = 2$ we find that $y' = -7$.

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

$$y = (-7)(x - 1) + 2.$$