

Homework II

Due: Apr. 9. (Fri) 23:59 PM

I. REMARK

- Reading materials: Ch 3.1-4.7 in the textbook.
- Don't write just an answer. Please describe enough processes to justify your answer.
- Either Korean or English is totally fine!!.
- "All our dreams can come true if we have the courage to pursue them."

II. PROBLEM SET

- 1) Find the slope of the function's graph at the given point. Then find an equation for the line tangent to the graph there.

$$f(x) = \sqrt{x+1}, \quad (8, 3)$$

- 2) Find all points (x, y) on the graph of $f(x) = 3x^2 - 4x$ with tangent lines parallel to the line $y = 8x + 5$.

- 3) At time $t \geq 0$, the velocity of a body moving along the horizontal s-axis is $v = t^2 - 4t + 3$.

- Find the body's acceleration each time the velocity is zero.
- When is the body moving forward? Backward?
- When is the body's velocity increasing? Decreasing?

- 4) Find the value of $(f \circ g)'$ at the given value of x .

$$f(u) = u^5 + 1, \quad u = g(x) = \sqrt{x}, \quad x = 1$$

- 5) Verify that the following pairs of curves meet orthogonally.

$$x^2 + y^2 = 4, \quad x^2 = 3y^2$$

- 6) When a circular plate of metal is heated in an oven, its radius increases at the rate of 0.01cm/min. At what rate is the plate's area increasing when the radius is 50 cm?

- 7) The function $f(x)$ changes value when x changes from x_0 to $x_0 + dx$. Find

- the change $\Delta f = f(x_0 + dx) - f(x_0)$.
- the value of the estimate $df = f'(x_0)dx$, and
- the approximation error $|\Delta f - df|$.

$$f(x) = x^2 + 2x, \quad x_0 = 1, \quad dx = 0.1$$

- 8) Suppose that f'' is continuous on $[a, b]$ and that f has three zeros in the interval. Show that f'' has at least one zero in (a, b) .

- 9) The derivative of the function $f(x)$ is given as $f'(x) = \frac{x^2(x-1)}{x+2}$, $x \neq -2$. Answer the following questions.

- What are the critical points of f .
- On what open intervals is f increasing or decreasing?
- At what points, if any, does f assume local maximum and minimum values?

- 10) A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single-strand electric fence. With 800m of wire at your disposal, what is the largest area you can enclose?