

Faculty of Business Administration
MATH102 Mathematics II
Spring 2020
Take Home Exam

Due Date: 7 May Thursday 23:59

Attention. Please read each questions carefully and write your answers neatly under the corresponding questions. Show all your work. Correct answers without sufficient and correct explanation might **not** get full credit. Homework delivered after the deadline will not be accepted. Please everyone do their own solutions. Good luck.

1. The total profit (in dollars) from the sale of x skateboards is

$$P(x) = 30x - 0.3x^2 - 250, \quad 0 \leq x \leq 100.$$

- (a) Find the **marginal profit** at a sale level of 25 skateboards per week and interpret the result.
- (b) Find the **exact profit** from the sale of the 26th skateboard.
- (c) Use marginal profit to approximate the **total profit** from the sale of 26 skateboard.

2. Calculate the derivative of the following.

(a) $y = (2^x + x^2)^2$ (b) $y = \frac{3x^2 - e^2}{2\sqrt{x^3}}$ (c) $x \ln y + 2y = 2x^3$; y' at $(1, 1)$

3. The price–demand equation for an order of fries at a fast-food restaurant is

$$x + 1000p = 2500.$$

- (a) Currently, the price of an order of fries is \$1. If the price is decreased by 10%, will revenue increase or decrease? Why?
- (b) Currently, the price of an order of fries is \$1.5. If the price is decreased by 10%, will revenue increase or decrease? Why?
- (c) What price will maximize the revenue from selling fries?

4. A T-shirt manufactureris planning to expand its workforce. It estimates that the number of T-shirts produced by hiring x new workers is given by

$$T(x) = -0.25x^4 + 6x^3, \quad 0 \leq x \leq 15.$$

- (a) When is the rate of change of T-shirt production increasing and when is it decreasing?
- (b) What is the point of diminishing returns?
- (c) What is the maximum rate of change of T-shirt production?
- (d) Graph T and T' on the same coordinate system, roughly.