

## Brief solutions to selected problems in homework week 09

1. Section 4.1, problem 77:

$$f'(x) = \frac{2}{3}(x-2)^{-\frac{1}{3}}$$

$f'(x) > 0$  on  $x > 2$ ,  $f'(x) < 0$  on  $x < 2$ .  $f'(2)$  does not exist.

So  $x = 2$  is the only critical point, and the only possible point where  $f(x)$  has a local extreme.

Check the signs of  $f'(x)$  on  $x > 2$  and  $x < 2$ . It follows that  $f(x)$  indeed has a local min at  $x = 2$ . Since it is the only local min, it is also the absolute min.

2. Section 4.2, problem 19:

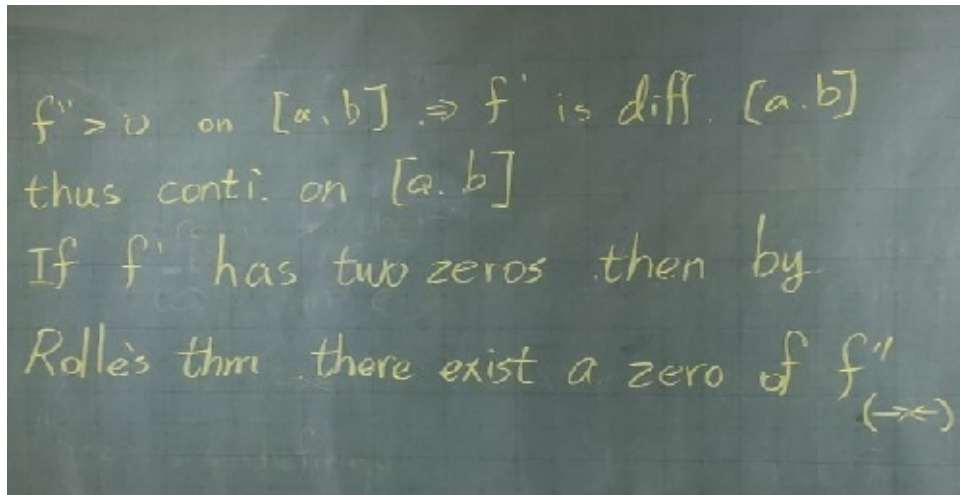


Figure 1: Section 4.3, problem 19

3. Section 4.2, problem 65:

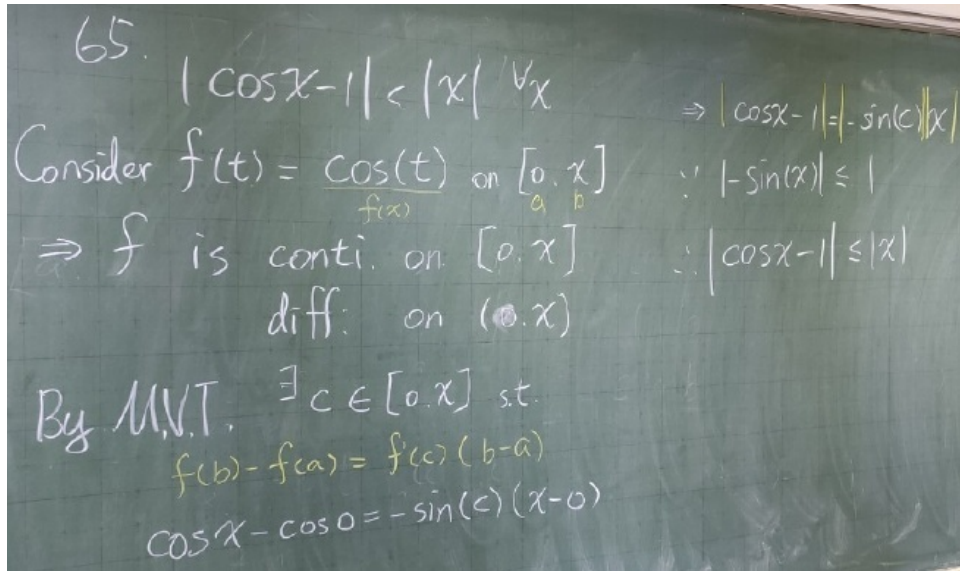


Figure 2: Section 4.2, problem 65

4. Section 4.3, problem 74:

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$$f'(x) = 3ax^2 + 2bx + c$$

①  $f(0) = 0$ ,  $f(1) = -1$   
 $d = 0$ ,  $a + b + c = -1$

②  $f'(1) = f'(0) = 0$   
 $c = 0$ ,  $3a + 2b = 0$

$\Rightarrow a = 2, b = -3$

Figure 3: Section 4.3, problem 74

5. Section 4.3, problem 77:

77.

$$f'(x) = e^x - 2, \quad f'(x) = 0 \text{ at } \ln(2)$$
$$f'(x) < 0 \text{ on } [0, \ln(2))$$
$$f'(x) > 0 \text{ on } (\ln(2), 1]$$

$f$  has an absolute minimum at  $\ln(2)$

$$\underline{f(0) = 1}, \quad f(1) = e - 2$$

absolute maximum

Figure 4: Section 4.3, problem 77