

MAC2311 Class Number 15498

QUIZ 9

3/21/2019

Name: SOLUTIONS

1. Find the critical numbers for the function

$$f(x) = \frac{1}{3}x^3 - \frac{5}{2}x^2 + 6x + 21$$

$$f'(x) = x^2 - 5x + 6 \quad \downarrow \quad f'(x) \text{ IS DEFINED FOR ALL } x$$

$$f'(x) = 0 \Rightarrow x^2 - 5x + 6 = 0 \Rightarrow (x-3)(x-2) = 0$$

$$\Rightarrow \boxed{x=3, x=2}$$

2. Find all numbers, c , that satisfy the conclusion of the mean value theorem for $f(x) = x^2 - 4x + 3$ on $[0, 3]$.

$$f(3) = 3^2 - 4(3) + 3 = 9 - 12 + 3 = 0$$

$$f(0) = 0^2 - 4(0) + 3 = 3$$

$$f'(c) = \frac{f(3) - f(0)}{3 - 0} \Rightarrow f'(c) = \frac{0 - 3}{3} = -\frac{3}{3} = -1$$

$$f'(x) = 2x - 4$$

$$f'(c) = 2c - 4$$

$$2c - 4 = -1 \Rightarrow 2c = 3 \Rightarrow \boxed{c = \frac{3}{2}}$$

3. Find the absolute maximum and minimum of $f(x) = x^3 + 3x^2$ on $[0, 2]$.

(1) EVALUATE f AT ENDPOINTS: $f(0) = 0^3 + 3(0)^2 = 0$, $f(2) = 2^3 + 3(2^2) = 8 + 12 = 20$

(2) FIND $f'(x)$: $f'(x) = 3x^2 + 6x$

(3) FIND x SUCH THAT $f'(x) = 0$: $3x^2 + 6x = 0$

$$3x(x+2) = 0$$

EITHER $3x = 0$ OR $x+2 = 0 \Rightarrow x=0, x=-2$

NOT IN DOMAIN OF f !

$$\boxed{f(0) = 0}$$

$$\Rightarrow \boxed{\begin{array}{l} \text{MAXIMUM: } 20 \\ \text{MINIMUM: } 0 \end{array}}$$