Kuwait University
Dept. of Mathematics
Math 101 (Final Exam.)

Time. 2 hours — January , 1990

Answer the following questions:

Q1. a) Find $\lim_{x \to 0} \frac{4x^2+3x \sin x}{x^2}$

b) Find $\frac{d}{dx}\left[\frac{\sin 3x}{1+2x}\right]^{\frac{1}{3}}$ (Do not simplify). (10 marks)

Q2. Solve $\frac{1}{2-x} \leq \frac{1}{4+x}$ (7 marks)

Q3. Find the equation of the tangent line of $5x^2+4y^2 = 56$ at $(-2,3)$. (7 marks)

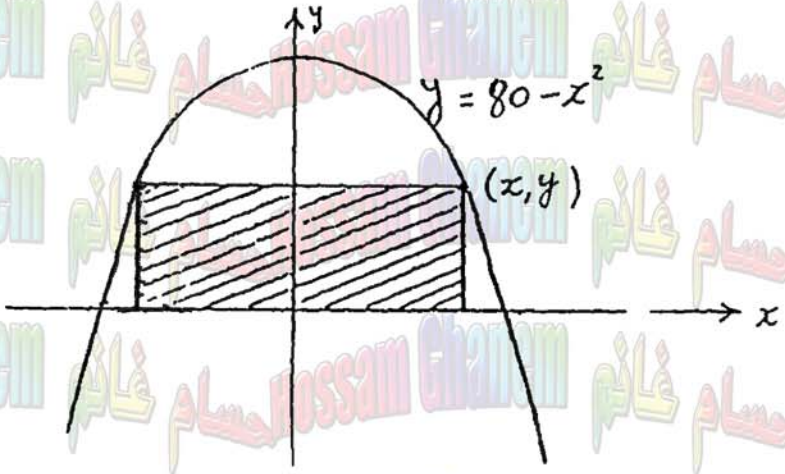
Q4. Let $f(x) = \begin{cases} \frac{|x-1|}{x^2-1} & \text{if } x \neq 1,\ x \neq -1 \\ \frac{1}{2} & \text{if } x = 1 \text{ or } x = -1 \end{cases}$

Is f continuous at $x = 1$? Explain. (8 marks)

Q5. Given that $f'(2) = 44$, find $\lim_{x \to 2} \frac{f(x)-f(2)}{x^2-4}$ (8 marks)

Q6. The area of a rectangle is increasing at a rate of 20 cm²/sec while its length is increasing at a rate of 3 cm/sec. Find the rate of change of its width when the rectangle is a square of area 100 cm². (10 marks)

Q7. Find the point (x,y) on the curve $y = 80 - x^2$ which makes the area of the shaded rectangle in the figure maximum. (10 marks)



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