

QUIZ # 7

NAME: KEY

1. Suppose f has a continuous derivative whose values are given in the following table.

x	0	1	2	3	4	5	6	7	8	9	10
$f'(x)$	5	2	1	-2	-5	-3	-1	2	3	1	-1

a) Estimate the x -coordinates of critical points of f .

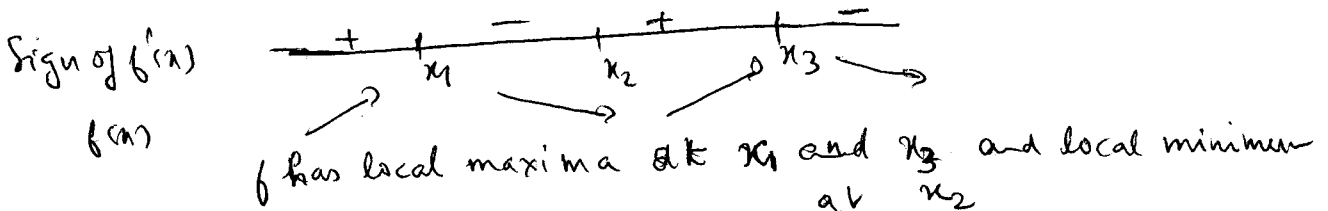
We have 3 critical points: x_1, x_2, x_3

$$x_1 \approx 2.5$$

$$x_2 \approx 6.5$$

$$x_3 \approx 9.5$$

b) For each critical point, indicate if it is a local maximum, a local minimum or neither.



2. Find the critical points and the inflection points of the following functions.

a) $f(x) = x^4 - 4x^3 + 5$

$$f'(x) = 4x^3 - 12x^2 = 4x^2(x-3)$$

$$f'(x) = 0 \Rightarrow x=0 \text{ or } x=3. \text{ The critical points are } 0 \text{ and } 3$$

$$f''(x) = 12x^2 - 24x = 12x(x-2). \quad f''(x) = 0 \Rightarrow x=0 \text{ or } x=2$$

Sign of $f''(x)$ | So f has inflection points at $x=0$ and $x=2$.

b) $g(x) = x^4 - 8x^2 + 12$

$$g'(x) = 4x^3 - 16x = 4x(x^2 - 4)$$

$$g'(x) = 0 \Rightarrow x=0, x=-2 \text{ or } x=2.$$

The critical points of g are $0, -2$, and 2

$$g''(x) = 12x^2 - 16 = 4(3x^2 - 4) = 12\left(x - \frac{2}{\sqrt{3}}\right)\left(x + \frac{2}{\sqrt{3}}\right)$$

$$g''(x) = 0 \Rightarrow x = \frac{2}{\sqrt{3}} \text{ or } x = -\frac{2}{\sqrt{3}}$$

Sign of $g''(x)$ | Inflection points of $g(x)$: $-\frac{2}{\sqrt{3}}$ and $\frac{2}{\sqrt{3}}$.