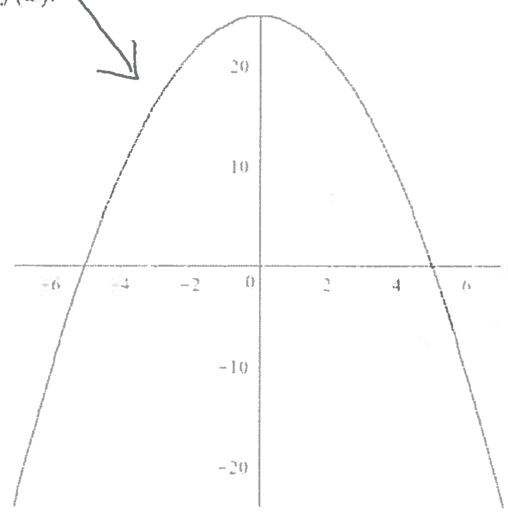
PRINTABLE VERSION

Quiz 12

Sol

Question 1

The graph of $f'(x)$,the derivative of $f(x)$, is shown below. Find the critical number(s) of $f(x)$.



a) $x = -5$

b) $x = 0$

c) $x = 5$

d) $x = \{-5, 5\}$

Critical numbers $\Rightarrow$

$f'(x) = 0 \Rightarrow x = -5$ or 5.

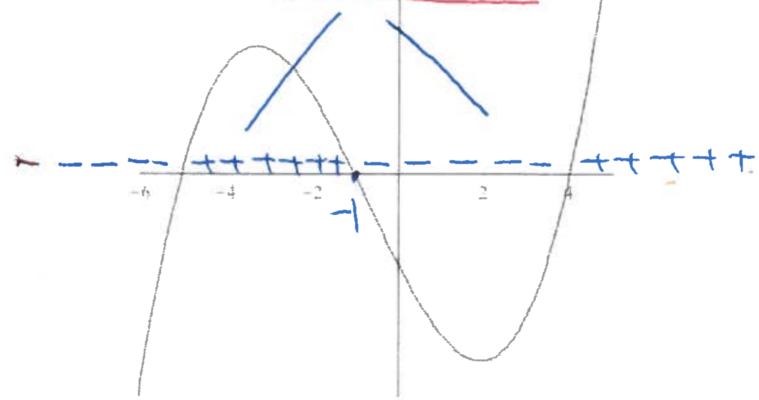
$f'(x)$ DNE $\Rightarrow$ NONE.

e) $x = \{-5, 0, 5\}$

Question 2

Suppose that $c = -1$ is a critical number for a function f. Determine if $f(c)$ is a local maximum, local minimum or neither if the graph of $f'(x)$ is shown below.

local max.



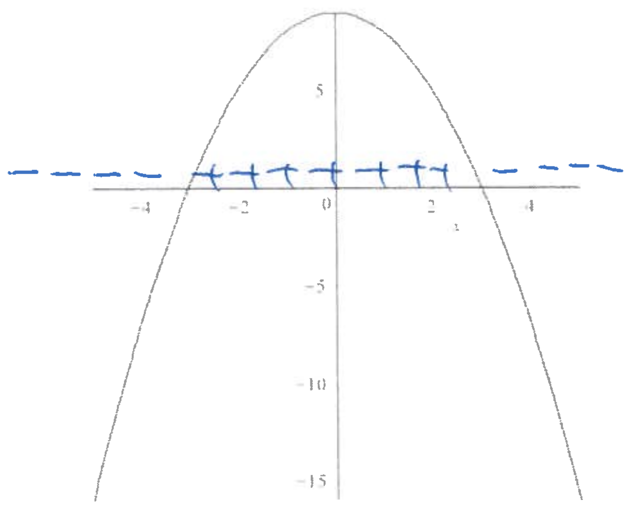
a) Neither

b) Local Minimum

c) Local Maximum

Question 3

The graph of f' is shown. Find the intervals on which f decreases.



⇒ Decreasing Interval(s)
$(-\infty, -3) \cup (3, \infty)$.

a) $(-\infty, \infty)$

b) $(-\infty, 0)$

c) f is not decreasing anywhere.

d) $(-\infty, -3)$ and $(3, \infty)$

e) $(0, \infty)$

Question 4

The graph of f' is shown. Find the intervals on which f increases.

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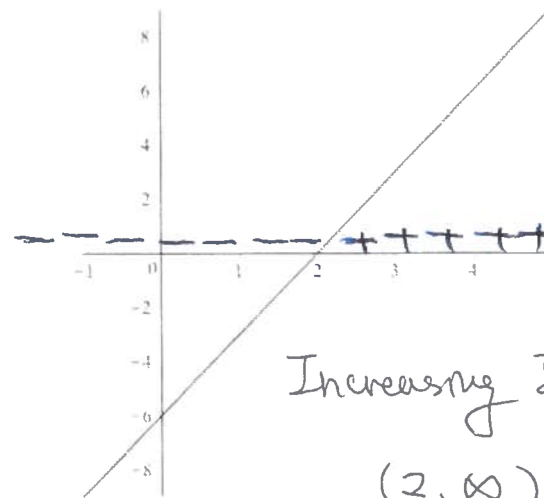


Increasing Interval:
$(2, \infty)$.

a) $(-\infty, \infty)$

b) $(-\infty, 2)$

c) f is not increasing anywhere.

d) (0∞)

e) $(2, \infty)$

5. $D(f) = \mathbb{R}$. $f' = 12x^2 + 12$
$= 12(x^2+1) > 0$
No critical numbers.
No local extreme value.

Question 5

Find the critical numbers of $f(x) = 4x^3 + 12x + 1$ and classify all local extreme values.

a) Critical no. 0; local max $f(0) = 1$.

b) No critical numbers, no local extreme values.

c) Critical nos. ± 1; local max $f(-1) = -15$; local min $f(1) = 17$.

d) Critical no. 0; local min $f(0) = 1$.

e) Critical nos. ± 1; local max $f(1) = 17$; local min $f(-1) = -15$.

Question 6 $D(f)=\{x \neq -2\}$, $f'(x) = \dfrac{-13}{(2+x)^2} < 0 \quad \forall x \in \mathbb{R}\setminus\{-2\}$

Find the critical numbers of $f(x) = \dfrac{5-4x}{2+x}$ and classify all local extreme values.

No Critical number, no extreme values

a) Critical nos. $-2, \frac{5}{4}$; local min $f(-2) = 0$; local max $f\left(\frac{5}{4}\right) = 0$.

b) Critical no. 0; local max $f(0) = 0$.

c) Critical no. $\frac{5}{4}$; local min $f\left(\frac{5}{4}\right) = 0$.

d) No critical numbers, no extreme values.

e) Critical nos. $0, \frac{5}{4}$; local min $f\left(\frac{5}{4}\right) = 0$; local max $f(0) = \frac{5}{2}$.

Question 7 $D(f)=\mathbb{R}$

Find the critical numbers of $f(x) = x^2 - 12x + 7$ and classify all extreme values given $0 \leq x \leq 8$.

$f'(x) = 2x - 12$.

a) Critical no. 0; local max $f(0) = 7$.

$f'(x) = 0 \Rightarrow x = 6$

$f'(x)$ DNE: NONE.

Number line of f': local min at 6

$f(6) = 36 - 72 + 7 = -29$ abs. min

$f(0) = 7$ abs. max

$f(8) = 64 - 96 + 7 = -25$

8. $D(f)=\mathbb{R}$. ($x^2+16>0$ for all x)

$f'(x) = \dfrac{-2(x^2-16)}{(x^2+16)^2}$

number line of f': local min at -4, local max at 4

Critical number: $f'(x)$ DNE: NONE

$f'(x) = 0 \Rightarrow x = \cancel{4}$ or -4

$\cancel{f(4)}$ NOT IN $[-5,3]$

$f(3) = \frac{6}{25}$; $f(-5) = \frac{-10}{41}$

$f(-4) = \frac{-8}{32}$

b) No critical numbers, no extreme values.

c) Critical nos. 0 and 6; local and absolute min $f(6) = -29$; absolute max $f(8) = -25$.

d) Critical no. 6 and 8; local max $f(8) = f(6) = -25$.

e) Critical no. 6; absolute max $f(0) = 7$; local and absolute min $f(6) = -29$.

Question 8 Critical number: -4. $f(3) = \frac{6}{25}$: abs. max

$f(-4) = -\frac{8}{32}$ abs. & local min

Find the critical numbers of $f(x) = \dfrac{2x}{x^2+16}$ and classify the extreme values given: $-5 \leq x \leq 3$.

a) No critical numbers, no extreme values.

b) Critical nos. 4 and -4; local and absolute min $f(-4)$; local and absolute max $f(4)$.

c) Critical no. -4; local and absolute min $f(-4)$; absolute max $f(3)$.

d) Critical no. -4; absolute min $f(3)$; local min $f(-4)$; absolute max $f(0)$.

e) Critical no. 0; local and absolute max $f(0)$.

Question 9 $D(f)=\mathbb{R}$. $f'(x) = -5\sqrt{3}\sin(x) + 10\sin(x)\cdot\cos(x)$

Find the critical numbers of $f(x) = 5\sqrt{3}\cos(x) + 5\sin^2 x$ and classify the extreme values given: $0 \leq x \leq \pi$.

$f'(x) = 0$: $-5\sin(x)(\sqrt{3} - 2\cos(x)) = 0 \Rightarrow \sin(x) = 0$ or $\cos(x) = \frac{\sqrt{3}}{2}$

a) Critical nos. 0 and π; local and absolute min $f(0) = 5\sqrt{3}$; local and

$\Rightarrow x = 0$ or π or $\frac{\pi}{6}$. $f(0) = 5\sqrt{3}$

$f\left(\frac{\pi}{6}\right) = \frac{35}{4}$ local max abs. max

$f(\pi) = -5\sqrt{3}$ abs. min

0 $\frac{\pi}{6}$ π local max.

absolute max $f(\pi) = -5\sqrt{3}$.

b) Critical nos. 0 and $\frac{\pi}{6}$; local and absolute max $f\left(\frac{\pi}{6}\right) = \frac{35}{4}$

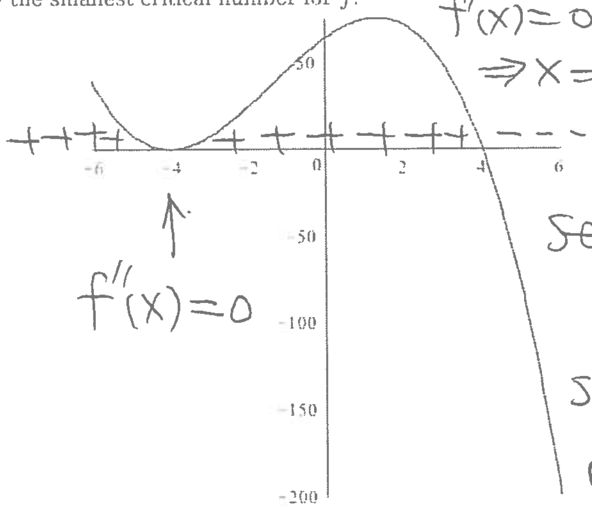
c) No critical numbers, no extreme values.

d) Critical no. $\frac{\pi}{6}$; local max $f\left(\frac{\pi}{6}\right) = \frac{35}{4}$

e) Critical no. $\frac{\pi}{6}$; absolute min $f(\pi) = -5\sqrt{3}$; local and absolute max $f\left(\frac{\pi}{6}\right) = \frac{35}{4}$

Question 10

Read Carefully! The graph of f' (the derivative of f) is shown below. Classify the smallest critical number for f.



$f''(x)=0$

$f'(x)=0$

$\Rightarrow x=-4$ or 4

but $f''(-4)=0$

~~So -4 is the only critical number.~~

So -4 is also a point of inflection

$\Rightarrow f(-4)$ is neither local max nor local min.

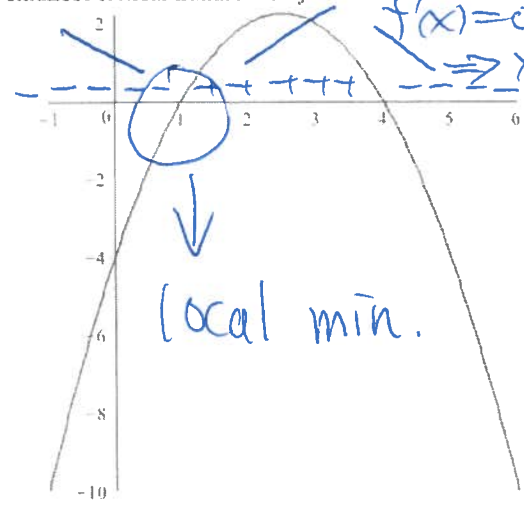
a) local maximum

b) local minimum

c) neither

Question 11

Read Carefully! The graph of f' (the derivative of f) is shown below. Classify the smallest critical number for f.



$f'(x)=0$

$\Rightarrow x=1$ and 4.

local min.

a) local maximum

b) neither

c) local minimum