# 4 Extreme Values

1- If $f(x) \le f(c), \forall x \in D_f$ then c is an absolute maximum
*a) true* *b) false*

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2- If $f(x) \le f(c)$ for all $x \in (a,b) \subseteq D_f$ then c is a local maximum
*a) true* *b) false*

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3- If $f(x) \ge f(c), \forall x \in D_f$ then c is an absolute minimum
*a) true* *b) false*

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4- If $f(x) \ge f(c)$ for all $x \in (a,b) \subseteq D_f$ then c is a local minimum
*a) true* *b) false*

---

5- The extreme values of $f$ are both the maximum and the minimum
*a) true* *b) false*

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6- If $f$ is continuous on a closed bounded interval [a,b], then $f$ has absolute extreme values
*a) true* *b) false*

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7- The number c will be a critical number of $f$ if
*a)* $c \in D_f$ *b)* $c \in (a,b) \subseteq D_f$
*c)* $c \in (a,b) \subseteq D_f$ *and* $f'(c) \neq 0$ *or* $f'(c)$ *is defined*
*d)* $c \in (a,b) \subseteq D_f$ *and* $f'(c) = 0$ *or* $f'(c)$ *is undefined*

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8- If $f(x) = x^2$ then $f$ has absolute minimum at *x=0*
*a) true* *b) false*

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9- If $f(x) = 3x^2 + 2x - 7$ has critical number which is
$f'(x) =$
$f'(x) = 0 \Rightarrow$
$f(x)$ *has critical number which is*

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10- $f(x) = \sqrt{x}$ has critical number which is
*a)* $-1/8$ *b)* 0 *c)* 3 *d) no critical number*

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11- $f(x) = 3x^4 - 16x^3 + 18x^2$ find absolute and local extreme values on[-1,4] at
*1)* $f(a) = f(-1)$
*2)* $f(b) = f(4) =$
*3)* $f'(x) = 0 \Rightarrow x \in \{x1, x2, x3, \ \}$
*4)* $f(x1) = \quad , f(x2) = \quad , f(x3) = \quad ,$

absolute maximum at $x =$ local maximum at $x =$
absolute and local minimum at $x =$ local minimum at $x =$

لا تسمح للحياة السريعة أن تسرق منك لحظات التعبد والطاعة، لا تجعل من صلاتك روتيناً تؤديه فى وقت معين بلا روح أو وعي ، اللحظات التي تختلي بها بذاتك لتقيم فيها نفسك وتنظف فيها روحك من شوائب الحياة هي أغلى دقائق الحياة.

12- $f(x)=x^3-3x+5$ has absolute extreme values on[-2,2] at

1)$f(a)=f(-2)=$

2)$f(b)=f(2)=$

3)$f'(x)=0\Rightarrow x\in\{\ ,\ \}$

4)$f(\ )=$

5)$f(\ )=$

local maximum at $x=$

absolute and local minimum at $x=$

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13- $f(x)=x^{3/5}(4-x)$ has critical numbers at x=

*1)* $f'(x)=0\Rightarrow$

*2)* $f'(x)not\ exist\ at$

---

14- $f(x)=x^{2/3}(2-x)$

has absolute maximum at *x*

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15- $f(x)=x^3-3x^2+1$ has absolute extreme values on $\left[-\frac{1}{2},4\right]$ at

*1)* $f(a)=f(-1/2)$

*2)* $f(b)=f(4)=$

*3)* $f'(x)=0\ \Rightarrow x\in\{x1,x2,\dots\}$

*4)* $f(x1)=\quad ,f(x2)=\quad ,$

absolute maximum at

absolute minimum at absolute minimum at

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قال رجل للحسن البصري : إني أريد سفرا فزودني ، قال : يا ابن أخي أعزَ أمر الله حيثما كنت يُعِزُك الله عز وجل

The shape of a Graph

1- If $f(x_1)<f(x_2)$ *whenever* $x_1<x_2$ then $f$ is said to be increasing on I

*a)true* *b)false*

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2- If $f(x_1)>f(x_2)$ *whenever* $x_1<x_2$ then $f$ is said to be decreasing on I

*a)true* *b)false*

---

3- The function $f(x)$ is continuous on [a,b], differentiable on (a,b). If $f'(x)>0;\forall x\in(a,b)$ then $f$ is **increasing on** [a,b]

*a)true* *b)false*

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4- The function $f(x)$ is continuous on [a,b], differentiable on (a,b). If $f'(x)<0;\forall x\in(a,b)$ then $f$ is **decreasing on** [a,b]

*a)true* *b)false*

---

5- If $f'$ changes from negative to positive at c , then $f$ has a **local minimum** at c

*a)true* *b)false*

---

6- If $f'$ changes from positive to negative at c, then $f$ has a **local maximum** at c

*a)true* *b)false*

---

7- If $f'$ **does not change sign** at c, then $f$ has **no local** extreme at c

*a)true* *b)false*

8- The graph of differentiable function *y=f(x)* is concave up on an open interval I if $f'$ increasing on I

*a)true* *b)false*

9- The graph of differentiable function *y=f(x)* is concave down on an open interval I if $f'$ decreasing on I

*a)true* *b)false*

10- If $f''>0$ , $\forall x \in I$ , then the graph of $f$ over I is **concave up**

*a)true* *b)false*

11- If $f''<0$ , $\forall x \in I$ , then the graph of $f$ over I is **concave down**

*a)true* *b)false*

12- A point where the graph of a function **changes concavity** is called an **inflection point**

*a)true* *b)false*

13- The function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ has a critical numbers at

$f'(x) = 0 \Rightarrow x \in \{ \quad ... \}$

| interval | Sign $f'$ | |
|---|---|---|
| | | |

14- The function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is increasing on

15- The function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is decreasing on

16- Critical numbers and inflection point to the function $f(x) = x^4 - 4x^3$ is

1) $f'(x) = 0 \Rightarrow x \in \{ x1 = \quad , x2 = \quad \}$
2) $f'' = 0 \Rightarrow x \in \{ x3 = \quad , x4 = \quad \}$
3) $f''(x1) = \quad , f''(x2) = \quad ,$

Local and absolute minimum at $x =$

inflection point at

17- Concavity and absolute extreme values to the function $f(x) = x^4 - 4x^3$ is

1) $f'' = 0 \Rightarrow x \in \{ x3 = \quad , x4 = \quad \}$,

concave in the interval ( , )

concave upward in the interval ( , )

concave downward the interval ( , )

| interval | | concavity |
|---|---|---|
| | | |

18- The function $f(x) = x^4 - 4x^3$ is increasing on

19- The function $f(x) = x^4 - 4x^3$ is decreasing on

20- The function $f(x) = x^3 - 3x^2 - 9x$ has local extrema at $x=$

$a) -1, 3 \quad b) 1, -3 \quad c) -1, -3$

21- The function $f(x) = x^3 - 3x^2 - 9x$ has critical numbers at

$a) -1, 3 \quad b) 1, -3 \quad c) -1, -3$

22- The absolute extreme of $f(x) = x^3 - 3x^2 - 9x$ on [-1,3] are

23- The local extreme values of $f(x)=x^3-3x^2-9x$ is

a) minimum at(-1,5)maximum at(3,-27)

b) minimum at(3,-27)maximum at(-1,5)

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24- The function $f(x)=x^3-6x^2-36x$ has critical numbers at

$a)-6\ ,-2$ $b)-2,\ 6$ $c)-6,2$

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25- The function $f(x)=x^3-6x^2-36x$ is increasing on

$a)(-\infty,-1)$ $b)(-\infty,-2)$ $c)(-2,6)$

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26- The function $f(x)=x^3-6x^2-36x$ is decreasing on

$a)(-\infty,-1)$ $b)(-\infty,-2)$ $c)(-2,6)$

---

27- The function $f(x)=x^3-6x^2-36x$ is increasing on

$a)(-\infty,-1)$ $b)(-2,6)$ $c)(6,\infty)$

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28- The function $f(x)=x^3-6x^2-36x$ concave down on

$a)(-\infty,-2)$ $b)(-\infty,2)$ $c)(-2,\infty)$

---

29- The function $f(x)=x^3-6x^2-36x$ concave up on

$a)(-\infty,-2)$ $b)(-2,\infty)$ $c)(2,\infty)$

---

30- The function $f(x)=x^3-6x^2-36x$ has inflection point at

$a)(-2,-88)$ $b)(2,-88)$ $c)(2,88)$

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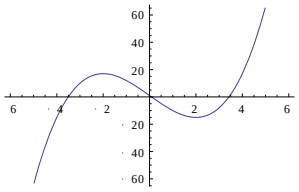
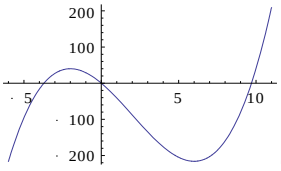
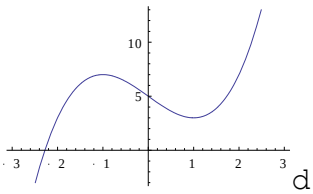
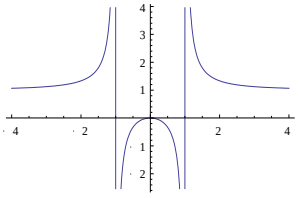
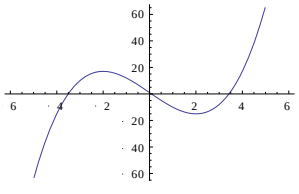
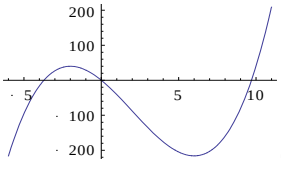
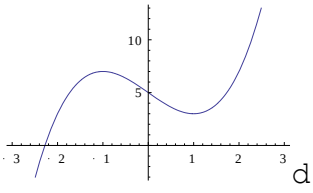
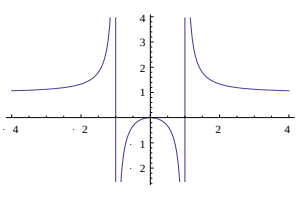
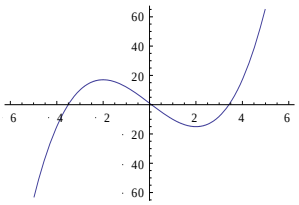
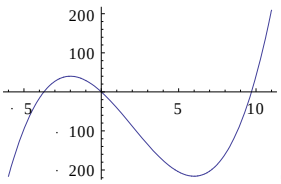
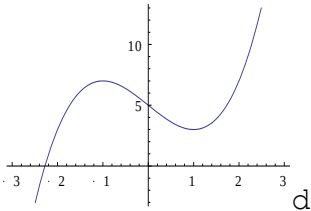
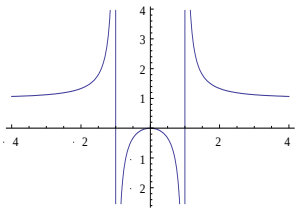
31- The graph of $f(x)=\dfrac{x^2}{x^2-1}$ is

a)  b)  c)  d) 

32- The graph of $f(x)=x^3-6x^2-36x$ is

a)  b)  c)  d) 

33- The graph of $f(x)=x^3-12x+1$is

a)  b)  c)  d) 

تسلح بالإيمان بالله والتسليم بالقضاء والقدر والثقة بوعد الله وإحسان الظن به، فأي من هذه جدير بأن تأخذ القلق أو الحزن أو الخوف إلى ما لا نهاية وتترك كي تستمتع بالراحة والسكينة النفسية