مدونة المناهج السعودية

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الموقع التعليمي لجميع المراحل الدراسية

في المملكة العربية السعودية

الاسم: .... الرقم الجامعي: .... الشعبة: .... رقم الكشف: ....

Q2

A) Write (T) for the true statement and write (F) for the false one: (1 mark for each)

1) The horizontal asymptote of $f(x) = \frac{x}{9-x^2}$, has an equation $y = 0$. ◆⋯⋯⋯➤ (T)

2) $\lim_{x\to5^-}\left[\frac{3}{2x-10}\right] = \infty$. ◆⋯⋯⋯➤ (F)

3) Let $f(x) = \begin{cases}\frac{x^2-6x-7}{x-7}, & x \neq 7\\ 2a, & x = 7\end{cases}$, be continuous at $x = 7$ then $a = 4$. ◆⋯⋯⋯➤ (T)

بسط

صورة

$\lim_{x\to7} = f(7)$

$\frac{8}{2} = \frac{\cancel{2}a}{\cancel{2}}$

$-3x^{-3}$

4) $\frac{d}{dx}\left(\frac{x^2}{2} - \frac{1}{3x^3}\right)\Big|_{x=1} = -2$. ◆⋯⋯⋯➤ (F)

$x + \frac{9}{x^4}$

B) Evaluate each of the following limits:

(1) $\lim_{x\to0}\left(\frac{x^3-2x^2}{2x}\right) = \frac{0}{0}$ (2 marks)

$\lim_{x\to0} \frac{x^2(x-2)}{\cancel{2x}} = \lim_{x\to0} \frac{x(x-2)}{2}$

$\frac{0}{2} = 0$

(3) $\lim_{x\to5}\frac{x-5}{\sqrt{x+4}-3} = \frac{0}{0}$ (3 marks)

مرافق

(2) $\lim_{x\to0}\left(\frac{5x+3\sin 3x}{2x}\right) =$ (2 marks)

$\lim_{x\to0} \frac{\frac{5x}{2x} + \frac{3}{}\boxed{\frac{\sin 3x}{2x}}}{\cancel{\frac{2x}{2x}}}$

$\frac{5}{2} + \frac{9}{2} = \frac{14}{2} = 7$

C) Discuss the continuity to the function: $f(x) = \begin{cases}2x-1, & x > 3\\ x^2-4, & x \leq 3\end{cases}$, at $x = 3$. (4 marks)

1) $f(3) = 5$

2) $\lim_{x\to3^+} 2x - 1 = 5$ $\lim_{x\to3^-} x^2 - 4 = 5$ $\lim_{x\to3} f(x) = 5$

3) $f(3) = \lim_{x\to3} f(x) = 5$

$f(x)$ is cont at $x = 3$

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Q1 Choose the correct answer (for ten) of the following: (one mark for each) **10**

(1) If $\lim_{x\to a} f(x) = 2$, $\lim_{x\to a} g(x) = -4$ then $\lim_{x\to a}[f(x) + (g(x))^2] = \cdots$

(a) 18	(b) -14	(c) -6	(d) 10

(2) The derivative of f at $x = a$,written $f'(a)$,is given by ⋯

(a) $\lim_{h\to 1}\left(\frac{f(a+h)-f(a)}{h}\right)$	(b) $\lim_{h\to 0}\left(\frac{f(a+h)+f(a)}{h}\right)$	(c) $\lim_{h\to 0}\left(\frac{f(a+h)-f(a)}{h}\right)$	(d) $\lim_{h\to 0}\left(\frac{f(h)-f(a)}{h}\right)$

(3) The vertical asymptote for the graph of $f(x) = \frac{x+2}{x^2-4}$ is equal to ⋯

(a) $x = -2$	(b) $x = \mp 2$	(c) $x = 2$	(d) $x = 0$

(4) The function $f(x) = 2 - |x + 1|$ does not satisfy Rolle's theorem on $[-2, 0]$ because ⋯

(a) $-1 \notin$ domain of f	(b) $f(-2) \neq f(0)$	(c) f is not continuous at $x = -1$	(d) f is not differentiable at $x = -1$

(5) For $f(x) = (x + 2)^{\frac{2}{3}}$, then $f''(-1) = \cdots$

(a) $-\frac{2}{3}$	(b) $-\frac{2}{9}$	(c) $\frac{2}{9}$	(d) $\frac{2}{3}$

(6) The value of B so that $f(x) = 2x^2 - 3Bx$, has a critical number at $x = 3$ is ⋯

(a) 4	(b) 2	(c) 0	(d) -3

(7) Let $f(x)$ be a differentiable function, such that $f'(1) = 4$, then $\frac{d}{dx}(x^2 + f(x))\Big|_{x=1} = \cdots$

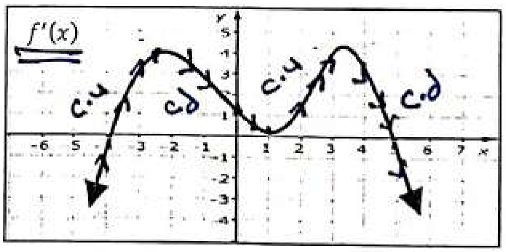
(a) 2	(b) 4	(c) 5	(d) 6

(8) The slope of the line tangent to the graph of $y = e^{-2x}$ at $x = 0$ is ⋯

(a) 2	(b) 1	(c) -2	(d) $-2e$

Given the graph of f'

X=-4 min
طالع المنحنى



X=5 max
نازل المنحنى

(9) (from the above figure) One of the critical numbers of $f(x)$ is ⋯

(a) $x = -5$	(b) $x = -2$	(c) $x = 5$	(d) $x = 4$

(10) (from the above figure) The interval on which $f(x)$ is increasing only is ⋯

(a) $(-\infty, -2]$	(b) $[1,5]$	(c) $[-4,6]$	(d) $[5, \infty]$

(11) (from the above figure) The x—coordinate on which $f(x)$ has a local minimum is ⋯

(a) $x = -4$	(b) $x = -3$	(c) $x = 1$	(d) $x = 5$

(12) (from the above figure) The interval on which $f(x)$ is only concave downward is ⋯

(a) $(-\infty, -2.5)$	(b) $(-2.5, 4)$	(c) $(1, 4)$	(d) $(3.5, \infty)$

Q3

A) Find $\frac{dy}{dx}$ to each of the following functions: (3 marks for each)

(1) $y = \frac{x}{x-1}$

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(3) $y = \ln\left(\frac{x^4 \sin x}{\sqrt{x+3}}\right)$.

$4\ln x + \ln\sin x - \frac{1}{2}\ln(x+3)$

$\frac{4}{x} + \frac{\cos x}{\sin x} - \frac{1}{2}\left(\frac{1}{x+3}\right)$

$\downarrow$

$\cot x$

(2) $y = x^3 \cos x - 3^{x^2}$

B) Find an equation of the tangent line to the curve: $x^2 - 4y^3 = 0$ at the point $(2,1)$. (4 marks)

$2x - 12y^2y' = 0$

$\frac{2x}{12y^2} = \frac{\cancel{12y^2}y'}{\cancel{12y^2}}$

$M = \frac{4}{12}$

$\boxed{M = \frac{1}{3}}$

$y - 1 = \frac{1}{3}(x - 2)$

C) Find the absolute extrema of $f(t) = t\sqrt{4-t^2}$ on the interval $[-1,2]$. (2 marks)

$f'(t) = 0$

$t \cdot \frac{-\cancel{2}t}{\cancel{2}\sqrt{4-t^2}} + \sqrt{4-t^2} = 0$

$\frac{-t^2}{\sqrt{4-t^2}} + \frac{\sqrt{4-t^2}}{1} = 0$

$\frac{-t^2 + 4 - t^2}{\sqrt{4-t^2}} = 0$

$f'(t) = 0$

$-2t^2 + 4 = 0$

$2t^2 = 4$

$t^2 = 2$

$\boxed{t = \sqrt{2} \in (1,2)}$

$t = -\sqrt{2} \notin (1,2)$

$f'(t)$ d.n.e

$\sqrt{4-t^2} = 0$

$4 - t^2 = 0$

$4 = t^2$

$t = 2 \notin (1,2)$

$t = -2 \notin (1,2)$

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P	V	
$\sqrt{2}$	2	max
-1	$-\sqrt{3}$	min
2	0	

Q4

A) Let $f(x) = x^3 - 6x^2 + 12x$, find the following:

(1) The interval(s) on which $f(x)$ is increasing and on which f is decreasing. (2 marks)

$f'(x) = 0$

$3x^2 - 12x + 12 = 0$

(2) Discuss the concavity. (2 marks)

$f''(x) = 0$

(3) The inflection point of $f(x)$. (one mark)

B) Show that $f(x) = x^2 - 3x + 1$, satisfies the condition of the mean value theorem on the interval [1,3], and then find the number c, that satisfies the conclusion of the theorem. (3 marks)

1) f(x) is cont on [1,3] poly

2) f(x) is diff on (1,3) poly

$f'(x) = \frac{f(3) - f(1)}{3-1}$

$2x - 3 = \frac{1+1}{3-1}$

$2x - 3 = 1$

$2x = 4$

$x = 2 \in (1,3)$

$\boxed{c = 2}$

C) ~~If $f(x) = (x-5)^2$, then find the local extrema of f, using the second derivative test.~~ (2 marks)

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