THE HASHEMITE UNIVERSITY

First Term 2009-2010

Final Exam
Calculus (I) 0101102

اسم الطالب:.................... الرقم الجامعي : ....

اسم مدرس المادة : .... رقم الشعبة أو وقت الشعبة : .... الرقم التسلسلي :

١. يمنع استخدام الآلة الحاسبة والخلويات .
٢. يتم اختيار أفضل اجابة ممكنة(واحدة فقط) ثم تظليلها
٣. يتم اعتبار الاجابة خاطئة اذا تم اختيار أكثر من اجابة واحدة.

Questions				
1	a	b	c	d
2	a	b	c	d
3	a	b	c	d
4	a	b	c	d
5	a	b	c	d
6	a	b	c	d
7	a	b	c	d
8	a	b	c	d
9	a	b	c	d
10	a	b	c	d
11	a	b	c	d
12	a	b	c	d
13	a	b	c	d
14	a	b	c	d
15	a	b	c	d
16	a	b	c	d
17	a	b	c	d
18	a	b	c	d
19	a	b	c	d
20	a	b	c	d
21	a	b	c	d
22	a	b	c	d
23	a	b	c	d
24	a	b	c	d
25	a	b	c	d

1. The function $f(\theta) = 10(\frac{4-2\cot\theta}{16} + \frac{2\csc\theta}{8})$ has a local minimum when

(a) $\cos\theta = \frac{1}{2}$ (b) $\cos\theta = \frac{-1}{2}$

(c) $\sin\theta = \frac{-1}{2}$ (d) $\sin\theta = \frac{1}{2}$

2. Let $f(x) = x^3 + x + 6$. Then $f^{-1}(6) =$

(a) 0 (b) $\frac{1}{6}$ (c) 1 (d) 4

3. The equation $2x^3 + bx^2 + 6x + 17 = 0$ has exactly one real root only if

(a) $|b| < 6$ (b) $|b| > 6$ (c) $|b| = 6$ (d) $b = 6$

4. Let $F(x) = \int_3^x \frac{\sin t}{t} dt$. Then $\lim_{x\to 3} \frac{x^2 F(x)}{x-3} =$

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

5. Let $\frac{d}{dx}(\int_3^{x^2} \frac{\sin t}{2t} dt) =$

(a) $\frac{\sin x^2}{x}$ (b) $\frac{\sin x}{2x}$ (c) $\frac{2\sin x^2}{x}$ (d) $\frac{2\sin x}{x}$

6. The area of the region enclosed by $y = \sqrt{16 - x^2}$ and $x - axis$ is

(a) 8π (b) 4π (c) 16π (d) 2π

7. $\lim_{x\to\infty} \cos(\frac{1}{x}) =$

(a) 0 (b) ∞ (c) 1 (d) *does not exist*

8. $\lim_{x\to 0} \frac{\sin x}{2x} =$

(a) 4 (b) 2 (c) $\frac{1}{2}$ (d) *does not exist*

9. The plane curve $y = x\cos x$ is symmetric about the

(a) $x - axis$ (b) $y - axis$
(c) origin (d) none of the above

10. The value of the number c that satisfy the equation $4x + \int_c^x \frac{\sin 3t}{t}dt = 8$ is

(a) 2 (b) 3 (c) 4 (d) 8

11. The period of the function $f(x) = 3\sin(x+4)$ is

(a) 2π (b) 4π (c) $\frac{\pi}{2}$ (d) $\frac{1}{4\pi}$

12. The domain of the function $f(x) = \sqrt{9-x}$ is

(a) $[0,9]$ (b) $[-3,3]$ (c) $(-\infty,9]$ (d) $[9,\infty)$

13. The area of the region enclosed by the parabolas $y = 2x - x^2$ and $y = x^2$ is

(a) $\frac{1}{6}$ (b) 1 (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

14. Let f be a function such that $f'(0) = 2$ and f satisfies the equation:
$f(x+y) = f(x)\,f(y)$ for all real numbers x, y. Then $f'''(0) =$

(a) 8 (b) 6 (c) -6 (d) -8

15. If $\int_0^4 f(x)dx = 16$, then $\int_0^2 xf(x^2)dx =$

(a) 4 (b) 8 (c) 16 (d) 6

16. $\int_0^7 \sqrt{x+9}\,dx =$

(a) $\frac{101}{3}$ (b) $\frac{74}{3}$ (c) 111 (d) 1

17. Let $\int_0^{\pi/2} \cos x \sin^2 x\,dx =$

(a) $\frac{\pi}{4}$ (b) $\frac{1}{4}$ (c) 1 (d) $\frac{1}{3}$

$\sin^2 x = u$

$2\sin x\cos x = \frac{du}{dx}$

$\int \cos x \cdot u \; du$ $\frac{1}{2} u^{\frac{3}{2}}$ $\left(\frac{1}{3}\right)$

Scanned with CamScanner

18. The volume of the solid obtained by rotating the region bounded by the curves $y = 2x^2 - x^3$ and $x - axis$, about $y - axis$ is

(a) $\frac{8\pi}{5}$ (b) $\frac{16\pi}{5}$ (c) $\frac{128\pi}{105}$ (d) $\frac{3\pi}{2}$

19. The volume of the solid obtained by rotating the region bounded by the curves $y = \frac{1}{x}$ and $x - axis$, $x = 1$, $x = 2$ about $x - axis$ is

(a) $\frac{\pi}{2}$ (b) $\frac{1}{2}$ (c) π (d) $\frac{3\pi}{2}$

20. If $\lim_{x \to 1} \frac{\sqrt{ax+b} - 2}{x - 1} = \frac{1}{3}$, then $a =$

(a) 3 (b) $\frac{8}{3}$ (c) $\frac{2}{3}$ (d) $\frac{4}{3}$

21. $\lim_{x \to \infty} \frac{2x + \sin 6x}{2x} =$

(a) 1 (b) 4 (c) 0 (d) 2

22. If $f(x) = x \cos x$, then $f^{(35)}(0) =$

(a) 0 (b) -35 (c) 35 (d) 36

23. Consider the equation: $y - \sin y = x$. Then $\frac{d^2y}{dx^2} =$

(a) $\frac{\sin y}{(1 - \cos y)^2}$ (b) $\frac{-\sin y}{(1 - \cos y)^2}$

(c) $\frac{\sin y}{(1 - \cos y)^3}$ (d) $\frac{-\sin y}{(1 - \cos y)^3}$

24. The function $f(x) = x^3 - 3x + 1$ has absolue maximum on $[-1, 3]$ at $x =$

(a) -1 (b) 1 (c) 2 (d) 3

25. $\lim_{x \to 0} \frac{\sqrt{1 + \tan x} - \sqrt{1 + \sin x}}{x^3} =$

(a) $\frac{1}{2}$ (b) $\frac{-1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{-1}{4}$

a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b
c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c		c	c	c
d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d		d	d	d
e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e		e	e	e	e		e	e	e

(1) If $x\sin\pi x = \int_0^{x^2} f(t)dt$, where $f(x)$ is continuous function, then $f(4) =$

(a) $\frac{1}{2}$ (b) $\frac{\pi}{4}$ (c) 1 (d) $\frac{\pi}{2}$ (e) π

(2) Simplify the following expression $3\int_a^b f(x)dx + 3\int_b^c f(x)dx + 7\int_c^a f(x)dx =$

(a) $13\int_a^c f(x)dx$ (b) $10\int_a^c f(x)dx$ (c) $-5\int_a^c f(x)dx$ (d) $-4\int_a^c f(x)dx$ (e) $3\int_a^c f(x)dx$

(3) The absolute max for the function $f(x) = \sin x$ in the interval $[0,\pi]$ is at $x =$

(a) $\frac{\pi}{2}$ (b) 0 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$ (e) π

(4) $\lim_{x\to1^+} x^{\frac{1}{1-x}} =$

(a) e (b) e^{-1} (c) e^{-2} (d) -1 (e) -2

(5) $\lim_{x\to+\infty} \frac{\sinh x}{e^x} =$

(a) does not exist (b) 2 (c) $\frac{1}{2}$ (d) $\frac{3}{2}$ (e) 0

(6) If $f(x)$ is continuous and $\int_0^2 f(x)dx = 6$, then $\int_0^{\frac{\pi}{2}} f(2\sin\theta)\cos\theta\, d\theta =$

(a) 10 (b) 20 (c) 12 (d) 6 (e) 3

(7) $\int_{-1}^{1} \frac{\sin x}{1+x^2}\,dx =$

(a) 2 (b) 1 (c) -1 (d) $2\int_{0}^{1} \frac{\sin x}{1+x^2}\,dx$ (e) 0

(8) $\int_{0}^{1} (1-x)^{11}\,dx =$

(a) $\frac{-1}{11}$ (b) $\frac{1}{12}$ (c) $\frac{-1}{12}$ (d) $\frac{1}{11}$ (e) 0

(9) $\int_{0}^{1} \frac{e^x}{1+e^{2x}}\,dx =$

(a) $\tan^{-1}(e) - \frac{\pi}{4}$ (b) $\tan^{-1}(e)$ (c) $-\frac{\pi}{4}$ (d) 0 (e) $\ln\left(\frac{1+e^2}{2}\right)$

(10) $\int \frac{\cos(\ln x)}{x}\,dx =$

(a) $-\cos(\ln x) + c$ (b) $\cos(\ln x) + c$ (c) $\ln(\sin x) + c$ (d) $-\sin(\ln x) + c$ (e) $\sin(\ln x) + c$

(11) $\int \frac{\sec x \tan x}{1+\sec x}\,dx =$

(a) $\ln|\sec x| + c$ (b) $\tan^{-1}(\sec x) + c$ (c) $\sin^{-1}(\sec x) + c$ (d) $\ln|\cos x| + c$ (e) $\ln|1+\sec x| + c$

(12) $\int_{0}^{2} |x-4|\,dx =$

(a) -6 (b) 0 (c) 4 (d) -4 (e) 6

(13) $\int \frac{x}{\sqrt{1-x^4}}\,dx =$

(a) $\frac{1}{2}\tan^{-1}(x) + c$ (b) $\frac{1}{2}\sin^{-1}(x) + c$ (c) $2\sin^{-1}(x^2) + c$ (d) $\frac{1}{2}\sin^{-1}(x^2) + c$ (e) $\frac{1}{2}\tan^{-1}(x^2) + c$

(14) $\int 5^x \sin(5^x)\,dx =$

(a) $\frac{-\cos(5^x)}{\ln 5} + c$ (b) $-\cos(5^x) + c$ (c) $\frac{\cos(5^x)}{\ln 5} + c$ (d) $\frac{\sin(5^x)}{\ln 5} + c$ (e) $\sin(5^x) + c$

(15) $\int_{0}^{\frac{\pi}{4}} \frac{1+\cos^2 x}{\cos^2 x}\,dx =$

(a) $\frac{\pi}{4}$ (b) $1+\frac{\pi}{4}$ (c) 2 (d) 1 (e) $2+\frac{\pi}{4}$

(16) $\lim_{x\to 0} \frac{x}{\tan^{-1}(4x)} =$

(a) 0 (b) $\frac{1}{4}$ (c) does not exist (d) 4 (e) $\frac{1}{2}$

(17) $\lim_{x\to+\infty} x\tan\left(\frac{\pi}{x}\right) =$

(a) 1 (b) $-\pi$ (c) π (d) -1 (e) $+\infty$

(18) $\lim_{x\to 0}(1-4x)^{\frac{2}{x}} =$

(a) 1 (b) e^{8} (c) e^{-8} (d) e^{-4} (e) e^{4}

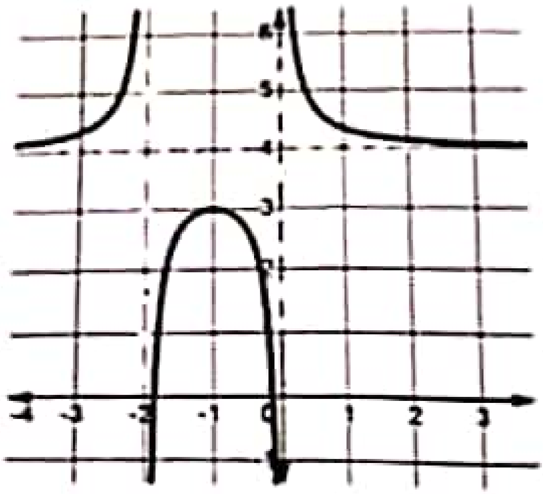
(19) The integral that represents the area of the region that enclosed by $y_1 = x^2$ and $y_2 = x+2$ is

(a) $\int_{-1}^{2}(-x^2+x+2)dx$ (b) $\int_{-1}^{2}(x^2-x-2)dx$ (c) $\int_{-1}^{2}(x^2+x+2)dx$ (d) $\int_{-1}^{2}(-x^2+x+2)dx$

(20) If $\sinh x = \frac{2}{3}$, then $\cosh x =$

(a) $\frac{\sqrt{13}}{3}$ (b) $\pm\frac{\sqrt{13}}{3}$ (c) $-\frac{\sqrt{13}}{3}$ (d) $\frac{\sqrt{13}}{2}$ (e) $\frac{\pm\sqrt{13}}{2}$

• Use the graph of the function $f(x)$ to answer the questions (21 – 27)



(21) The domain of $f(x)$ is :

(a) $\mathbb{R}$ (b) $\mathbb{R}-[-2,0]$ (c) $[-2,0]$ (d) $\mathbb{R}-\{-2\}$ (e) $\mathbb{R}-\{0,-2\}$

(22) $\lim_{x\to-2^+} \tanh(f(x)) =$

(a) 1 (b) -1 (c) 0 (d) $-\infty$ (e) does not exist

(23) $f(x)$ has horizontal asymptote at $y =$

(a) 4 (b) -2 (c) 0 (d) -1 (e) no horizontal asympto

(24) is the function $f(x)$ one – to – one function ?

(a) No (b) Yes

(25) The Interval(s) of decreasing is(are):

(a) $(-1,+\infty)$ (b) $(-\infty,-2)\cup(-2,-1)$ (c) $(-1,0)\cup(0,+\infty)$ (d) $(-\infty,-2)$ (e) $(-\infty,+\infty$

(26) The Interval of concave down is:

(a) $(-\infty,+\infty)$ (b) $(-2,0)$ (c) $(-\infty,-2)$ (d) $(0,+\infty)$ (e) $(-\infty,1)$

(27) $f(x)$ has a horizontal tangent at $x =$

(a) -1 (b) 0 (c) -2 (d) 4 (e) no horizontal ta

Good luck

final Exam
calc one

1) $x \sin \pi x = \int_0^{x^2} f(t)\,dt$ Find $f(4)$?

موجودين جوا التكامل بدنا نتخلص
من التكامل ... نشتق الطرفين
التكامل المشتق Fundamental thm.

$x \cdot \pi \cos \pi x + \sin \pi x = 2x\, f(x^2)$

$4 = f$ يعني الي جوا $f(4)$ بده سؤال؟

$x^2 = 4 \quad x = \pm 2$

$2\pi \underbrace{\cos 2\pi}_{1} + \sin 2\pi = 4 f(4)$

$2\pi + 0 = 4 f(4)$

$\boxed{f(4) = \pi/2}$

(d)

لو عوضنا -2 بدنا نفس الجواب

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(2) simplify $3\int_a^b f(x)\,dx + 3\int_b^c f(x)\,dx + 7\int_c^a f(x)\,dx$

عامل مشترك من أول تكاملين

$3\left(\int_a^b f(x)dx + \int_b^c f(x).dx\right) + 7\int_c^a f(x).dx$

خاصية الاضافة

$= 3\int_a^c f(x)dx + 7\int_c^a f(x).dx$

الحدود مش زي بعض لازم نقلب ونضرب بسالب

$3\int_a^c f(x).dx - 7\int_a^c f(x).dx$

$= -4\int_a^c f(x).dx$

(d)

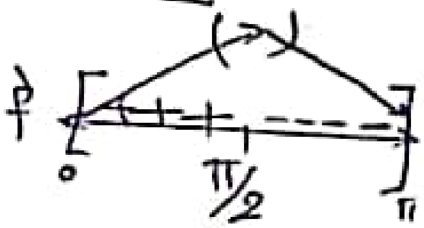
سؤال بده تفكير بسيط فكرته طالعة عن خاصية الاضافة

3- $f(x) = \sin x \quad x \in [0, \pi]$

Abs. max ?

$f'(x) = \cos x = 0$

$\boxed{x = \pi/2}$



at $\boxed{x = \pi/2}$ there's an abs. max

مباشر (a)

4- $\lim_{x \to 1^+} x^{\left(\frac{1}{1-x}\right)} = \boxed{(1)^{\infty}}$ لوبيتل

$y = \lim_{x \to 1^+} x^{\left(\frac{1}{1-x}\right)}$

$\ln y = \lim_{x \to 1^+} \frac{1}{1-x} \ln x \Rightarrow \ln y = \lim_{x \to 1^+} \frac{\ln x}{1-x} = \boxed{\frac{0}{0}} \to L'H$

$\ln y = \lim_{x \to 1^+} \frac{\frac{1}{x}}{-1}$

$\ln y = -1 \quad y = e^{-1}$ (b)

مباشر لوبيتال

5-) $\lim_{x\to\infty} \frac{\sinh x}{e^x} = \boxed{\frac{\infty}{\infty}}$

اشتقه بس
صورته البحة
عالفاضي

هكذا بدوجه
sinh
لأصلها

$\lim_{x\to+\infty} \frac{e^x - e^{-x}}{2e^x} \quad \boxed{\frac{\infty}{\infty}}$

وزّع

هكذا عامل
مشترك

$\lim_{x\to+\infty} \frac{e^x(1 - e^{-2x})}{2e^x} = \frac{1-0}{2} = \boxed{1/2}$ Ⓒ

حلينا نفس الفكرة

6-] $\int_0^2 f(x)\,dx = 6 \qquad \int_0^{\pi/2} f(2\sin\theta)\cos\theta\,d\theta = ?$

حاصل ضرب اقترانين أحدهما مشتقة الآخر
معناه تعويض

$y = 2\sin\theta$

$d\theta = \frac{dy}{2\cos\theta}$

الحدود
العلوية $y = 2\sin\frac{\pi}{2}$
$= ②$
السفلية $y = 0$

$\int_0^2 f(y)\cdot \cos\theta \cdot \frac{dy}{2\cos\theta}$

$= \frac{1}{2}\int_0^2 f(y)\,dy$

بالسؤال

$= \frac{1}{2}\cdot 6 = \boxed{3}$

Ⓒ

مباشر

7) $\int_{-1}^{1} \frac{\sin x}{1+x^2} \cdot dx$ $\quad \frac{odd}{Even} = odd$

$= Zero$ // كتب زيرو بالغلط

(a)

8-) $\int_{0}^{1} (1-x)^{10} \cdot dx = \frac{(1-x)^{11}}{11} \Big]_0^1$

$= 0 - \left(\frac{(1-0)^{11}}{11} \right)$

$= \boxed{\frac{1}{11}}$ (d) مباشرة على القاعدة.

9) $\int_0^1 \frac{e^x}{1+e^{2x}} \cdot dx$

كتبت لنفسه فيها اعلامي

$= \int_0^1 \frac{e^x}{1+(e^x)^2} \cdot dx$

$\boxed{a=1}$

$\boxed{f(x)=e^x}$

$= \frac{1}{1} \tan^{-1}\left(\frac{e^x}{1}\right)\Big]_0^1$ ~~$+c$~~

$=$ ~~$\tan^{-1}(1)$~~ $\tan^{-1}(e) - \boxed{\tan^{-1}(1)}$ $\pi/4$

$= \tan^{-1}(e) - \pi/4$

(a)

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10) $\int \frac{\cos(\ln x)}{x} \cdot dx$

نفس بالمتغير ...

$y = \ln x$

$dx = \frac{dy}{1/x} \Rightarrow dx = x\,dy$

$= \int \frac{\cos(y)}{x} \cdot x \cdot dy = \int \cos y \cdot dy = \sin y + c$

$= \sin(\ln x) + c$

(e)

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11) $\int \frac{\sec x \tan x}{1+\sec x} \cdot dx$

نتأمل البسط كاملاً ثم بنفكر هل مشتقة المقام بالبسط؟ ...

$= \ln|1+\sec x| + c$

(c)

مباشر

12] $\int_0^2 |x-4| \cdot dx$

لنشرح في المكثف

$x - 4 = 0$

$\boxed{x = 4}$

$\underset{4-x}{- - -} \; \underset{4}{|} \; \overset{x-4}{+ +}$

بنأخذ ليه شوفو حدود التكامل ...

$$= \int_0^2 (4 - x) \cdot dx = 4x - \frac{x^2}{2} \Big]_0^2 = (8-2) - (0)$$

$$= \boxed{6} \; (e)$$

13] $\int \frac{x}{\sqrt{1-x^4}} \cdot dx$

بسطه على مقام حل مشتقة المقام بالبسط لأنه نحل بالإنفيرس شرحت نفسه بالمراجعة

$$= \int \frac{x}{\sqrt{1-(x^2)^2}} \cdot dx$$

$f(x) = x^2 \rightarrow f'(x) = 2x$

بنجي ② سهل صعب بالبسط

$$= \frac{1}{2} \int \frac{2x}{\sqrt{1-(x^2)^2}} \cdot dx = \frac{1}{2} \sin^{-1}(x^2) + c$$

مباشر نفس اللي بالمكثف ... (d)

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14] $\int 5^x \sin(5^x)\,.dx$

sin (كيف طلعت)

شو؟ تعويض

$y = 5^x$

$dx = \dfrac{dy}{5^x \ln 5}$

$= \int 5^x \sin y \,.\dfrac{dy}{5^x \ln 5} = \dfrac{1}{\ln 5}\int \sin(y)\,.dy$

$= \dfrac{-1}{\ln 5}\cos(5^x) + C$

مباشر وواضح ... (a)

15] $\int_0^{\pi/4} \dfrac{1+\cos^2 x}{\cos^2 x}\,.dx = \int_0^{\pi/4} \left(\dfrac{1}{\cos^2 x} + 1\right).dx$

$= \int_0^{\pi/4} (\sec^2 x + 1)\,.dx = \tan x + x \Big]_0^{\pi/4}$

$= 1 + \pi/4 - 0 = 1 + \pi/4$ (b)

مباشر وبسيط

16] $\lim_{x\to 0} \dfrac{x}{\tan^{-1}(4x)} = \boxed{\dfrac{0}{0}} \rightarrow L'H$

$\lim_{x\to 0} \dfrac{1}{\frac{4}{1+16x^2}} = \lim_{x\to 0} \dfrac{1+16x^2}{4} = \boxed{\dfrac{1}{4}}$

(b)

مباشر

17] $\lim_{x \to \infty} x \tan(\pi/x) = \boxed{\infty \cdot 0}$

حالة
من حالات
لوبتال
شرحتها
بالفيديو

$\lim_{x \to \infty} \frac{\tan(\pi/x)}{1/x} = \boxed{\frac{0}{0}} \longrightarrow L'H$

$= \lim_{x \to \infty} \frac{\frac{-\pi}{x^2} \cdot \sec^2(\pi/x)}{\frac{-1}{x^2}} = \lim_{x \to \infty} \pi \sec^2 \pi/x$

$= \pi \sec^2(0)$

$= \frac{\pi}{1} = \boxed{\pi}$ (c)

مباشرة

18] $\lim_{x \to 0} (1-4x)^{2/x} = \boxed{1^{\infty}}$

حالة من حالات
لوبتال شرحت نفسها
مباشرة

$= e^{(-4 \cdot 2)} = e^{-8}$ (c)

19-) $y_1 = x^2 \quad y_2 = x+2$

نفسه
بالفيديو

$y_1 = y_2 \quad x^2 = x+2$

$x^2 - x - 2 = 0 \rightarrow (x-2)(x+1) = 0$

$\boxed{x = 2} \quad \boxed{x = -1}$

$\text{Area} = \int_{-1}^{2} |x^2 - x - 2| \, dx$

عيد التعريف

عكس الاشارة

$+ + \ | \ -1 \ | \ - - \ | \ 2 \ | \ +$

$A = \int_{-1}^{2} (-x^2 + x + 2) \, dx$ (d)

20] $\sinh x = \frac{2}{3}$ find $\cosh x$?

مباشر

Sol. $\cosh^2 x - \sinh^2 x = 1$

$\cosh^2 x - \frac{4}{9} = 1$

$\cosh^2 x = 1 + \frac{4}{9}$

$\cosh^2 x = \frac{9+4}{9} = \boxed{\frac{13}{9}} \to \cosh x = +\sqrt{\frac{13}{9}}$

رسمته كلها فوق السينات ... $= \boxed{+\frac{\sqrt{13}}{3}}$

(a) مباشر

21] dom... سؤال الرسمة..

دوائر مفرغة بالأعداء... $\Rightarrow R - \{0, -2\}$

(e)

22] $\lim\limits_{x \to -\infty} \tanh(f(x))$

$= \tanh(\lim\limits_{x \to -\infty} f(x))$ من الرسمة $= \tanh(-\infty)$

$= \boxed{-1}$ (b)

حكيت النظرية بتدخل على أي معادلة

23] H.asy واضح بالرسمة $\Rightarrow \boxed{y = 4}$ (a)

رسمت عنه بدورة

24] one to one?

ارسم خطوط أفقية $\Rightarrow$ Not one to one

حكيت عنه بالدورة.

25] decreasing:- نازل $\Rightarrow (-1, 0) \cup (0, \infty)$ (c)

شرحته بدورة خطيا فهم الرسم

26] concave down $\{(-2, 0)$ واضح

27] Horizontal tangent $\Rightarrow x = -1$ (a)

خط أفقي قمة وقاع ⟵ too

موجود بالدورة

3. The interval of decreasing of the following function *
(3 Points)

$$f(x) = \frac{2}{(x^2-9)^2}$$

- $(-3, 0) \cup (3, \infty)$
- $(-\infty, -3) \cup (3, \infty)$
- $(-3, 3)$
- $(-\infty, -3) \cup (0, 3)$

13. *

(3 Points)

$$\lim_{x\to\infty} xe^{\left(\frac{1}{x}\right)} - x =$$

- $\frac{1}{3}$
- $-\frac{1}{3}$
- 3
- -3

16. Let *
(3 Points)

$f(x) = x^2 - 6x + 2$, with $x \in (-\infty, 3]$.

Then $f^{-1}(x) =$

- $3 - \sqrt{x + 7}$
- $3 + \sqrt{x + 7}$
- $3 - \sqrt{x - 7}$
- $3 + \sqrt{x - 7}$

10. Find the set of all critical points of the following function *
(3 Points)

$$f(x) = \begin{cases} \frac{x^3}{3} - 3x^2 & \text{if } x > 0 \\ x^3 - 3x & \text{if } x < 0 \end{cases}$$

- $\{-1, 0, 1, 6\}$
- $\{1, -6\}$
- $\{-1, 0, 1, -6\}$
- $\{0, 1, -6\}$
- $\{-1, 0, 6\}$
- $\{-1, 6\}$

14. One of the following functions is NOT a one-to-one function. *
(3 Points)

- $f(x) = x^2 + 1, \; x \in [0, 8]$
- $f(x) = \sin(x), \; x \in [\frac{\pi}{2}, \frac{3\pi}{2}]$
- $f(x) = |x|, \; x \in [-3, -1]$
- $f(x) = \cos(x), \; x \in [\frac{-\pi}{2}, \frac{\pi}{2}$

8. *

(3 Points)

$$\int_{-\ln(2)}^{\ln(3)} \left| e^{x} - e^{2x} \right| dx =$$

- $\frac{34}{16}$
- $\frac{40}{18}$
- $\frac{10}{16}$
- $\frac{26}{16}$

2. *

(3 Points)

Let $F(x) = \int_{3}^{\frac{1}{2}x} \sinh(t)\,dt.$

Then $F''(\ln(16)) =$

- $\frac{5}{12}$
- $\frac{5}{16}$
- $\frac{13}{20}$
- $\frac{17}{48}$

7. *
(3 Points)

The point $(2, -4)$
is an extreme value
of the function
$f(x) = \frac{a}{\pi} \sin(\pi x) - bx$
Then $-3a + 4b =$

- -14
- -2
- 14
- 2

15. *

(3 Points)

$$\lim_{x \to 0^+} \frac{\sin(7\pi x)}{x^2 - x} =$$

- 0
- 7π
- ∞
- -7π

4. *

(3 Points)

$$\int \frac{3}{x+x(\ln(3x))^2}\,dx =$$

- $\frac{1}{3}\tan^{-1}(\ln(3)+\ln(x))+C$
- $\tan^{-1}(3\ln(x))+C$
- $3\tan^{-1}(\ln(3)+\ln(x))+C$
- $\tan^{-1}(\ln(3x))+C$

5. *

(3 Points)

Let $k > 0$. Then $\lim_{x \to \infty} x^{-2k+3} = 0$ if

- $k > \frac{2}{3}$
- $k > \frac{3}{2}$
- $k > \frac{4}{3}$
- $k < \frac{3}{2}$

12. *

(3 Points)

$$\int \frac{\sin(2x)}{\sqrt{5+\sin^2(x)}}\,dx =$$

- $2\sqrt{6-\cos^2(x)} + C$
- $2\sqrt{5-\sin^2(x)} + C$
- $2\sqrt{7-\sin^2(x)} + C$
- $2\sqrt{5-\cos^2(x)} + C$

1. *

(3 Points)

If $f(x) = 2x\cos^{-1}(3x)$. Then $f'(0)$

- 2π
- $\frac{5\pi}{2}$
- π
- $\frac{3\pi}{2}$

6. Find the interval in which the following function is concave down *
(3 Points)

$$f(x) = \frac{x^4}{12} - x^2 + 6x + 12$$

- $(-\infty, -2) \cup (2, \infty)$
- $(-\sqrt{2}, \sqrt{2})$
- $(-2, 0) \cup (2, \infty)$
- $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$

9. If f(x) is continuous, then f(x) is differentiable *
(2 Points)

- Ture
- False

17. *
(3 Points)

Let $\int_{4}^{6} f\left(\frac{x}{2}\right)dx = 6.$

$\int_{2}^{5} 2f(x)dx = -4.$

Then $\int_{3}^{5} -3f(x)dx =$

- 20
- −20
- −15
- 15

11. *
(3 Points)

If $\int_0^1 3f(x)\,dx = -9.$

Then $\int_1^e \frac{f(ln(x))}{2x}\,dx$

- $\frac{-5}{4}$
- $\frac{-3}{4}$
- $\frac{-5}{2}$
- $\frac{-3}{2}$

5. Find *
(1 Point)

$$\frac{d}{dx}\left(\int_1^{x^2} t\,\sin t.\ dt\right)$$

- $2x^3 \sin x^2$
- $2x^3 \sin 2x$
- $2x^3 \cos x^2$
- $2x^3 \cos 2x$

4. Find the value of *
(1 Point)

$\cosh(\ln 2)$.

- $\frac{4}{3}$
- $\frac{3}{4}$
- $\frac{5}{4}$
- $\frac{4}{5}$

3. Find the integral *
(1 Point)

$$\int \frac{1+\sin^2 x}{\sin^2 x} dx$$

- $\sec x \tan x + c$
- $\tan x + x + c$
- $-\cot x + x + c$
- $\sec x + \tan x + c$

2. On what interval is f increasing. Given that the derivative of a function f is *
(1 Point)

$$f'(x) = (x+5)^2(x+3)(x+4)^4$$

- $(-\infty, -3)$
- $(-4, \infty)$
- $(-5, \infty)$
- $(-3, \infty)$

1. Evaluate the following integral *
(1 Point)

$\int_0^2 (x^2 + 2^x).\, dx$

- $\frac{8}{3} + \frac{3}{\ln 2}$
- $\frac{1}{3} + \frac{1}{2}\ln 2$
- $\frac{8}{3} + 2\ \ln 2$
- $\frac{1}{3} + \frac{3}{\ln 2}$