Q 1) If $y = x^{\sin x}$, then $\frac{dy}{dx} =$

a) $\left(\cos x \ln x + \frac{\sin x}{x}\right)$ b) $\left(\cos x \ln x + \frac{\sin x}{x}\right)x^{\sin x}$ c) $(\sin x)x^{\sin x - 1}$

d) $\left(\frac{\cos x}{x} + \sin \ln x\right)x^{\sin x}$ e) None .

Q 2) $\lim_{x \to 0^+} \csc x - \frac{1}{x} =$

a) 0   b) 1   c) $+\infty$ d) 2   e) None

Q3) The discontinuity points for the function $f(x) = \frac{|x| - 2}{|x-2| - 1}$ are

a) x=1,-1   b) x=0,1   c) x=2,-2   d) x=1,3   e) None

Q4) The slope of tangent line to $y = (\cos^{-1} x)^2$ at $x = \frac{-1}{\sqrt{2}}$

$2 \cos^{-1} x \cdot \left(\frac{-1}{\sqrt{1-x^2}}\right)$

$\pi/4 + \pi/2 = \left(\frac{3\pi}{4}\right)\sqrt{2}$

$3\pi/4$

a) $\frac{-3\pi}{\sqrt{2}}$ b) $\frac{3\pi}{\sqrt{2}}$ c) $\frac{-3\pi}{4}$ d) $\frac{3\pi}{4}$ e) None

$\frac{-1}{\sqrt{1 - \frac{1}{2}}}$

$= \frac{-1}{\sqrt{1/2}}$

$= -\sqrt{2}$

Q5) $f(x) = \tan^{-1} x^2, \quad f'(x) =$

a) $2x \tan^{-1} x^2$ b) $\frac{2x}{1+x^4}$ c) $2x(\sec^{-1} x^2)^2$ d) $\frac{1}{1+x^4}$ e) None

$\frac{1}{1+(x^2)^2} \cdot 2x \quad = \frac{2x}{1+x^4}$

Q6) If $f(x)=\sqrt[3]{u(x)}$ given $f(1)=2$, $u'(1)=3$, then $f'(1)=$

a) $\frac{3}{8}$ b) $\frac{1}{12}$ c) $\frac{1}{2}$ d) $\frac{1}{4}$ e) None

Q7) $x^2y=3xy^3-x$, $\frac{dy}{dx}=$

a) $\frac{3y^3-2xy-1}{x^2-9xy^2}$ b) $\frac{3y^3-2xy}{x^2-9xy^2}$ c) $\frac{x^2-9xy^2}{3y^3-2xy}$ d) $\frac{3y^3+2xy+1}{x^2-9xy^2}$ e) None

Q 8) Equation of tangent line to the curve $y=\sec^2 2x$ at $x=\frac{\pi}{8}$ is

a) $y=x+2-\frac{\pi}{8}$ b) $y=4x+2-2\pi$ c) $y=8x+2-\pi$ d) $y=\frac{1}{2}x+1-\frac{\pi}{4}$ e) None

Q9) $y=\cosh(\ln(\cos x))$, $\frac{dy}{dx}=$

a) $-\sinh(\ln(\cos x))\tan x$ b) $\frac{-\sin x}{\ln(\cos x)}\sinh(\ln(\cos x))$

c) $\sinh(\ln(\cos x))\tan x$ d) $\sinh(\ln(\cos x))\ln(\sin x)$ e) None

Q10) $y=\left(\frac{4^x}{2^{x+1}}\right)^2$, $y^{(15)}=$

a) $\frac{4^x(\ln 2)^{15}}{2^{x-13}}$ b) $2^{2x+15}(\ln 2)^{15}$ c) $2^{2x+13}(\ln 2)^{15}$ d) $2^{15}2^{2x}(\ln 2)^{15}$ e) None

Best Wishes.

Al-Balqa' Applied University
Faculty of Engineering Technology, Applied Science Department

First Exam, Math. 101

Name: [illegible] **Instructor:**..................
Lecture Time:........................ **Date:** 29/10/2014.

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Q1) $\lim_{x\to+\infty} \sec\left(\dfrac{1-\pi x^2}{3x^2+1}\right)=$

a) $\dfrac{-\sqrt{3}}{2}$ b) 2 c) -2 d) $\dfrac{1}{2}$

Q2) $\lim_{x\to 3}(x^2-9)\cot(x^2-x-6)=$

a) 0 b) $\dfrac{9}{4}$ c) $\dfrac{6}{5}$ d) $\dfrac{3}{2}$

Q3) If $f(x)=\dfrac{2x^2+1}{(2x-1)^2-1}$, then horizontal and vertical asymptotes are

a) $y=\frac{1}{2}, x=0, x=1$ b) $y=1, x=0, x=1$ c) $y=\frac{1}{2}$, *No vertical* Asy. d) $y=1, x=0, x=4$

Q4) $\lim_{x\to 2^+}(x-2)\sin\left(\dfrac{1}{x^2-4}\right)$

a) 4 b) $+\infty$ c) $-\infty$ d) 0

Q5) $f(x)=\dfrac{g(x^2)}{h(3x)}$, $f(2)=1, h(6)=2, h'(6)=4, g'(4)=6,$ *then* $f'(2)=$

a) 6 b) 12 c) -3 d) 0

Q6) The discontinuity points for $f(x)=\dfrac{\cot x}{\sqrt{x^2-4}-1}$ are

a) $\pm\sqrt{3}, \pm n\pi, (-2,2)$ b) $\pm\sqrt{3}, \pm\left(\frac{2n+1}{2}\right)\pi, [-2,2]$ c) $\pm\sqrt{5}, \pm n\pi, (-2,2)$ d) $\pm\left(\frac{2n+1}{2}\right)\pi, (-2,2)$

Q7) $f(x)=\sec^2 x^2$, then $f'(x)=$

a) $2x\sec^2 x^2\tan x^2$ b) $4x\sec^2 x^2\tan x^2$ c) $4x\sec x^2\tan x^2$ d) $4x\sec^2 x\tan x$

Q8) $f(x)=\begin{cases}\dfrac{ax^2-b}{x-2} & ,x<2\\ \dfrac{1}{4}x^2-c & ,x\geq 2\end{cases}$ f is differentiable at x=2 ,then the values of a , b and c are

a) $a=1,b=4,c=-3$ b) $a=4,b=8,c=1$ c) $a=2,b=8,c=-3$ d) $a=1,b=4,c=1$

Q9) $\lim_{x\to -\infty}\sqrt{x^2+4x}-\sqrt{x^2-x}$

a) $\dfrac{-3}{2}$ b) $\dfrac{-5}{2}$ c) $\dfrac{3}{2}$ d) $+\infty$

Q10) $\lim_{x\to 1}\dfrac{\sin(x^2-1)+\cos(x^2-1)-1}{x-1}$

a) 0 b) 4 c) 2 d) $+\infty$

Write the answers

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
d	a	a	b	c	b	b	a	b	c

Fill in the table below with the correct answer of the following (10) questions

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
c	d	d	d	b	c	b	d	c	c

Q 1) If $\lim_{x \to 1} \dfrac{x^3 + 2x^2 - x + a}{x^2 - 1}$ exist then a= [illegible]

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

Q 2) $\lim_{x \to 0} \dfrac{\sqrt{x+9} - 3}{x}$ are

a) $\frac{1}{4}$ b) 0 c) $+\infty$ d) 1/6

Q3) $f(x) = \begin{cases} |2x-6| & x \le 2 \\ \dfrac{x^3 + 3x^2 - 12x + 4}{x^3 - 4x} & x > 2 \end{cases}$, then $\lim_{x \to 2^+} f(x) =$ and $\lim_{x \to 2} f(x) =$

a) 2 , 2 b) $\frac{3}{2}$, DNE c) $\frac{3}{2}$, 2 d) 2 , DNE

Q4) The horizontal asymptotes for $f(x) = \dfrac{2x^2 + 1}{x + 2x^2} + \dfrac{x-2}{3 - |x|}$ are

a) y=2 , y=0 b) y=3 , y=0 c) y=2 ,y=3 d) y=1 ,y=3

Q5) The vertical asymptotes for $f(x) = \dfrac{2x^2 - 5x + 2}{x^2 - 4}$

a) x=2 b) x=2 , x= -2 c) x=-2 d) No vertical asymptotes

Q6) $\lim_{x\to 3}\frac{\sin(x-3)}{x^2-2x-3}=$ $\frac{0}{0}$

a) $+\infty$ b) 0 c) $\frac{1}{4}$ d) $\frac{1}{5}$

Q7) $\lim_{x\to -\infty}\cos\left(\frac{\pi x}{2-3x}\right)$

a) $\frac{\sqrt{3}}{2}$ b) $\frac{-\pi}{3}$ c) $-\frac{\sqrt{3}}{2}$ d) $\frac{1}{2}$

Q 8) $f(x)=\begin{cases}\frac{\tan kx}{x} & ,x<0\\ 2x+3k^2 & ,x\geq 0\end{cases}$, all values of k that let $\lim_{x\to 0}f(x)$ exist are

a) $k=0,\frac{1}{3}$ b) $k=0,2$ c) $k=0$ d) $k=0,\frac{1}{2}$

Q9) $\lim_{x\to 0^+}3x\sin\frac{2}{x}=$ squizeng therom

a) 6 b) $\frac{1}{2}$ c) 0 d) $\frac{2}{3}$

Q10) $\lim_{x\to 3^-}\frac{x^2-3x}{x^2-6x+9}=$ $\frac{0}{0}$

a) $\frac{1}{2}$ b) $-\infty$ c) $+\infty$ d) $\frac{1}{2}$

Best Wishes.

$\frac{2x-3}{2x-6}=\frac{3}{0}=\infty$

*Remak : Write only the final answer

Q1) (6 marks) Quick answer

a) $\int \cos(2x-1)dx =$ ... $\frac{\sin(2x-1)}{2}$ dx + C ...

b) $f(x) = x + 4x^{-1}$ has critical point(s) at $x =$ ...2 / -2...

$1 + \frac{-4}{x^2}$

c) $\int \frac{dx}{\sqrt{1-2x}} =$ ... $-\sqrt{1-2x} + C$ ...

d) $\int_{-1}^{1} \sqrt{x^2 - 6x + 9}\,dx =$ ...6...

e) If $f(x) = \int_0^x (t^5+1)^3\,dt$, then f is concave up on ...$(-\infty, \infty)$...

f) $\lim_{x\to\infty} x(2^{\frac{1}{x}} - 1) =$ ...Ln 2...

Q2) If $f(x) = x^2 - \frac{8}{x-1}$, then the interval of increasing is ...

Q3) $\lim_{x\to 0}(e^x + 2x)^{\frac{1}{x}} =$ ...e^3...

Q4) *The function* $f(x) = px^2 + qx + 2$ *has* $(1,4)$ *as an extreme point, then*

$p = ..-2..$ *and* $q = ...4.....$

2

Q5) *If* $y = \frac{(\tan^{-1} x)^x}{\sqrt[3]{\sec hx}}$, *then*

2

$y' = \frac{\tan^{-1} x}{\sqrt[3]{\sech x}} \cdot \left(\frac{x}{(x^2+1)(\tan^{-1} x)} + \ln \tan^{-1} x + \frac{\tanh x}{x} + \frac{\ln \sech x}{x} \right)$

Q6) *The function* $f(x) = x^4 + kx^3 + \frac{1}{2}x^2$ *has exactly two horizontal tangent lines,*

then $k = ..\frac{5}{3}.........$

2

Q7) $\int (3^x)^2 \sec^2 3^{2x} \tan^3 9^x \, dx = ...\frac{1}{\ln 9} \left(\frac{\tan^4 9^x}{4}\right)$....................

$\ln 3 \cdot \tan$ $\boxed{\frac{1}{\ln 3} \cdot \frac{(\tan 3^{2x})^4}{2} + c}$

2

Q8) $\int_0^6 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{6-x}} \, dx = ...$