**Name.....** **Roll No.....**

# Department of Mathematics
# Guru Nanak Dev University, Amritsar-143005
## Quiz Test in Mathematics II: B.Sc.(Hons.)Chemistry Semester II

**April, 2011** **Max. Marks 10**
**Course Code#MTL142** **Time Allowed: 60 Minutes**

*Note:* Read the instructions carefully:
★ Attempt all 20 questions by ticking ✓ *only* one of the four choices (a), (b), (c), and (d) for each question below.
★ Response to any question marked for more than one choice will not be counted for any score.

1. In the implicit equation $y^2 - x = 0,\ x,\ y \in \mathbb{R}$
   (a) $y$ is a function of $x$ (b) $x$ is a function of $y$
   (c) it does not define a function (d) none

2. $\sin(\tan^{-1} x),\ |x| < 1$ is equal to
   (a) $\dfrac{1}{\sqrt{1-x^2}}$ (b) $\dfrac{1}{\sqrt{1+x^2}}$ (c) $\dfrac{x}{\sqrt{1-x^2}}$ (d) $\dfrac{x}{\sqrt{1+x^2}}$

3. The function $f : \mathbb{N} \to \mathbb{N}$ defined by $f(x) := x + 1$ is
   (a) bijective (b) surjective but not injective
   (c) injective but not surjective (d) none of these

4. The function $f(x) := \begin{cases} x & 0 < x < 1 \\ 1 & \text{otherwise} \end{cases}$ is
   (a) continuous at every point (b) continuous exactly at one point
   (c) discontinuous at every point (d) discontinuous exactly at one point

5. If $f : A \to B$ and $g : B \to A$ are invertible functions then $(f \circ g)^{-1}$ is equal to
   (a) $f^{-1} \circ g^{-1}$ (b) $g \circ f^{-1}$ (c) $f^{-1} \circ g$ (d) $g^{-1} \circ f^{-1}$

6. If $f : A \to B$ and $g : B \to A$ are invertible and differentiable functions then $((f \circ g)^{-1})'(b)$ is equal to
   (a) $\dfrac{1}{(f \circ g)'(g^{-1}(f^{-1}(b)))}$ (b) $\dfrac{1}{(f \circ g)'(g(f^{-1}(b)))}$
   (c) $\dfrac{1}{(f \circ g)'(g^{-1}(f(b)))}$ (d) $\dfrac{1}{(f \circ g)'(f^{-1}(g^{-1}(b)))}$

7. The sum of the series $1 - \dfrac{1}{2} + \dfrac{1}{3} - \dfrac{1}{4} \cdots \infty$ is equal to
   (a) $e^{-1}$ (b) $\log 2$ (c) $\dfrac{\pi}{2}$ (d) none

8. The limit $\lim\limits_{x \to 0} x \sin\left(\dfrac{1}{x}\right)$ is equal to
   (a) 1 (b) 2 (c) 0 (d) limit does not exist

9. A real number $\lambda$ is said to be a derivative of a function $f$ at a point $x = a$ if for every $\epsilon > 0$ there is a $\delta > 0$ such that
   (a) $\left|\dfrac{f(x) - f(a)}{x - a} - \lambda\right| < \epsilon$ implies $|x - a| < \delta$ (b) $\left|\dfrac{f(x) - f(a)}{x - a} - \lambda\right| > \epsilon$ implies $|x - a| < \delta$
   (c) $\left|\dfrac{f(x) - f(a)}{x - a} - \lambda\right| < \epsilon$ for all $|x - a| < \delta$ (d) none

10. $\dfrac{d}{dx}x^x,\ x>0$ is equal to
(a) $1+\log x$ (b) $x^x$ (c) $x^x\log x$ (d) $x^x(1+\log x)$

11. There is a change of 0.1% in radius of a wire in the form of a *solid* right circular cylinder when it is stretched by 10% of its initial length. If the initial radius and height of the wire are equal then change in its total surface area is
(a) 5.51% (b) 5.15% (c) 5.05% (d) 0.515%

12. The domain of the function $\dfrac{d}{dx}\sec^{-1}(x)$ is
(a) $(-\infty,\infty)$ (b) $(-\infty,\infty)-(-1,1)$ (c) $(-\infty,\infty)-[-1,1]$ (d) $(0,\pi)$

13. If $g(t)=\begin{vmatrix} f(x) & 1 & x & \frac{x^2}{2} & \frac{x^3}{6} \\ f(0) & 1 & 0 & 0 & 0 \\ f'(0) & 0 & 1 & 0 & 0 \\ f''(0) & 0 & 0 & 1 & 0 \\ f''(t) & 0 & 0 & 1 & t \end{vmatrix}$, for some three times differentiable function $f$. Then
(a) $g'(t)>0$ for all $t$ (b) $g'(t)<0$ for all $t$
(c) $g'(t)=0$ for some $t\in(0,x)$ (d) $g'(t)=0$ for some $t\in[0,x]$

14. If $f(x,y)-y=0$ such that $y$ is an implicit function of $x$ and the partial derivative $\dfrac{\partial f}{\partial y}(x,y):=f_y(x,y)>5$ for all $x$ then
(a) $\dfrac{dy}{dx}=\dfrac{f_x(x,y)}{f_y(x,y)}$ (b) $\dfrac{dy}{dx}=-\dfrac{f_x(x,y)}{f_y(x,y)}$ (c) $\dfrac{dy}{dx}=\dfrac{f_x(x,y)}{f_y(x,y)-1}$ (d) $\dfrac{dy}{dx}=\dfrac{f_x(x,y)}{1-f_y(x,y)}$

15. If $(x-a)^2+(y-b)^2=c^2,\ c>0$ then
(a) $c^2\left(\dfrac{d^2y}{dx^2}\right)^3=\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^2$ (b) $c^2\left(\dfrac{d^2y}{dx^2}\right)^2=\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^3$
(c) $c^2\dfrac{d^2y}{dx^2}=\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^3$ (d) none

16. If $f(x,y):=x^{-1/3}\dfrac{x^6+y^6}{x^3-y^3},\ x>y>0$ then
(a) $x\dfrac{\partial f}{\partial x}+y\dfrac{\partial f}{\partial y}=\dfrac{2}{3}f$ (b) $x\dfrac{\partial f}{\partial x}+y\dfrac{\partial f}{\partial y}=\dfrac{5}{3}f$ (c) $x\dfrac{\partial f}{\partial x}+y\dfrac{\partial f}{\partial y}=\dfrac{8}{3}f$ (d) $x\dfrac{\partial f}{\partial x}+y\dfrac{\partial f}{\partial y}=\dfrac{11}{3}f$

17. The cone with maximum volume that can be inscribed in a sphere of radius 3/2 has volume equal to
(a) $\dfrac{2\pi}{3}$ (b) $\dfrac{4\pi}{3}$ (c) $\dfrac{3\pi}{4}$ (d) none

18. The function $f(x):=(x-1)(x-2)$ is decreasing on
(a) $(-\infty,\infty)$ (b) $(-\infty,3/2)$ (c) $(3/2,\infty)$ (d) $(-3/2,3/2)$

19. Maximum value of the function $f(x):=2\cos(3x)+3\sin(3x)$ is
(a) $\sqrt{13}$ (b) $\sqrt{10}$ (c) $\sqrt{5}$ (d) none

20. The Taylor series expansion of function $f(x):=1+\sin x$ about the point $x=0$ is
(a) $1-\dfrac{x^2}{2!}+\dfrac{x^4}{4!}-\dfrac{x^6}{6!}+\cdots\infty$ (b) $1+x-\dfrac{x^3}{3!}+\dfrac{x^5}{5!}-\dfrac{x^7}{7!}+\cdots\infty$
(c) $x-\dfrac{x^3}{3!}+\dfrac{x^5}{5!}-\dfrac{x^7}{7!}+\cdots\infty$ (d) does not exist

Key:MTL142

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|---|---|
| 1.$b$ | 11.$b$ |
| 2.$d$ | 12.$c$ |
| 3.$c$ | 13.$c$ |
| 4.$d$ | 14.$d$ |
| 5.$d$ | 15.$b$ |
| 6.$a$ | 16.$c$ |
| 7.$b$ | 17.$b$ |
| 8.$c$ | 18.$b$ |
| 9.$c$ | 19.$a$ |
| 10.$d$ | 20.$b$ |