IMCG (PG), F-7/4, ISLAMABAD
SEND UPS (2013)
MATHEMATICS (HSSC II)

Roll No: _____ Name: _____ Section: _____

TIME ALLOWED: 20 min

Max.marks : **20**

SECTION-A

NOTE: Write the correct ANSWER of each in the provided BOX from the given options.

1. If $f(x) = \frac{x-1}{x-4}$ then domain of f^{-1} is _____.

A. R – { 1 } B. R – {4} C. The set of real numbers D. The set of integers

2. $\lim_{h\to 0} \frac{f(2+h)-f(2)}{h}$ = _____ .

A. $f'(x)$ B. $f'(2)$ C. $f'(h)$ D. None of these

3. $\frac{d}{dx}\left(5^{\frac{x^2}{2}}\right)$ = _____

A. $x\,5^{\frac{x^2}{2}}\,ln5$ B. $\frac{ln5}{5^{\frac{x^2}{2}}}$ C. $5^{\frac{x^2}{2}}$ D. None of these

4. $\int \frac{dx}{\frac{2}{3}x + a}$ = _____

A. $ln(\frac{2}{3}x - a)$ B. $\frac{2}{3}lnx - a$ C. $\frac{3}{2}\,ln\,(\frac{2}{3}x - a)$ D. $\frac{3}{2}$

5. Any point where f is neither increasing nor decreasing is called a

A. common point B. critical point C. stationary point D. point of inflection

6. $\int_0^1 \frac{dx}{1+x^2}$ =_____

A. $\frac{\pi}{2}$ B. $\frac{\pi}{6}$ C. $\frac{\pi}{4}$ D. $\frac{\pi}{3}$

7. The lines represented by $ax^2 + 2hxy + by^2$=0 are coincident if :

A. $h^2 - ab < 0$ B. $h^2 - ab = 0$ C. $h^2 - ab > 0$ D. $h^2 + ab = 0$

8. If $\int_1^3 f(x)dx = 5$ *and* $\int_3^7 f(x)dx = 9$ *then* $\int_1^7 f(x)dx$ =_____

A. 14 B. 10 C. 8 D. 4

9. A unit vector is a vector whose magnitude is

A. zero B. one C. More than 1 D. Less than 1

10. If y = csc h^{-1} x then $\frac{dy}{dx}$ = _____

A. $\frac{-1}{x\sqrt{1+x^2}}$ B. $\frac{1}{x\sqrt{1+x^2}}$ C. $\frac{-1}{x\sqrt{1-x^2}}$ D. $\frac{1}{x\sqrt{1-x^2}}$

11. $\frac{d}{dx}(e^2)$ = _____

A. e^2 B. 0 C. $2e^2$ D. none of these

12. The point P(1,2) lies _____ the line $x + y + 1 = 0$.

A. above B. on C. below D. on the same sides

13. Which of the following can be direction angles of a vector ?

A. $30^\circ, 30^\circ, 45^\circ$ B. $60^\circ, 30^\circ, 45^\circ$ C. $45^\circ, 60^\circ, 60^\circ$ D. $30^\circ, 30^\circ, 60^\circ$

14. If $xy = 3$ then $\frac{dy}{dx}$ = _____

A. $\frac{x}{y}$ B. $\frac{-x}{y}$ C. $\frac{-y}{x}$ D. 0

15. If $f(x) = x^{2/3} + 6$ then f is a/an _____ function.

A. Odd B. Even C. Neither even nor odd D. Constant

16. The slope of a vertical line is _____

A. 0 B. $\frac{\pi}{2}$ C. 1 D. undefined

17. If $x\cos\alpha + y\sin\alpha = 5$, then perpendicular distance of the given line from (0 , 0) is:

A. 0 B. 5 C. -5 D. none of these

18. $\int e^{2x}\,(2\sin x + \cos x)\,dx$ = _____

A. $\frac{1}{2}e^{2x}$ B. 0 C. $e^{2x}\sin x + c$ D. $e^{2x}\cos x + c$

19. The unit vector in the direction of $\vec{a} = (2, 1)$ is :

A. (1 , 1) B. $(\frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}})$ C. $(\frac{-2}{\sqrt{5}}, \frac{1}{\sqrt{5}})$ D. (0 , 0)

20. Which of the straight lines passes through the origin?

A. $y = 2x + 3$ B. $x = -1$ C. $y = 2x$ D. $y = 2$

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IMCG (PG), F-7/4, ISLAMABAD

SEND UPS (JAN 2013)

MATHEMATICS (HSSC II)

TIME ALLOWED: 02 hrs 40 min

SECTION-B

Max.marks : 40

NOTE: Attempt any 10 questions. All questions carry equal marks.

Q.1 : Evaluate $\lim_{\theta \to 0} \frac{1-\cos p\theta}{1-\cos q\theta}$

Q.2 : If $x = a\cos^3\theta$, $y = b\,sin^3\theta$, show that $a\frac{dy}{dx}$ + b tanθ = 0

Q.3 : Evaluate : $\int \sin^2 x \, dx$

Q.4 : State and prove that the normal form of a straight line

Q.5 : Evaluate $\int \boldsymbol{sin^2 x}\,\mathbf{dx}$.

Q.6 : State and prove that Normal form of equation of a straight line.

Q.7 : Find an equation of the perpendicular bisector of the segment joining the points A(3 , 5) and B(9 , 8).

Q.8 : Use vectors to show that ABCD is a parallelogram , when the points A , B , C and D are respectively (0 , 0) , (a , 0) , (b , c) and (b – a , c)

Q.9 : Evaluate $\int_0^2 |x-1|$

Q.10: Find the lengths of the sides of a variable rectangle having area 36 cm^2 , when its perimeter is minimum.

Q.11: Draw the graph: $x = t - 1$, $y = 2t - 1$ *where* $-1 < t < 5$

Q.12: Differentiate $cosh\,2x$ w.r.t $sinh\,3x$.

Q.13: Use differentials to approximate the value of $\sqrt[4]{17}$

Q.14: If $\vec{u} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$, $\vec{v} = 4\hat{\imath} + 6\hat{\jmath} + 2\hat{k}$ and $\vec{w} = -6\hat{\imath} - 9\hat{\jmath} - 3\hat{k}$, then show that $\vec{u}$, $\vec{v}$ and $\vec{w}$ are parallel to each other.

SECTION-C

Max.marks:40

NOTE: Attempt any 05 questions. All questions carry equal marks.

Q.1 : Prove that : $\lim_{x \to 0} \left(\frac{a^x - 1}{x} \right) = ln\, a$

Q.2 : Differentiate $\cos\sqrt{x}$ using first principles.

Q.3 : Evaluate : $\int \frac{(9x+6)}{(x^3 - 8)}\,dx$

Q.4 : Evaluate : $\int \sqrt{4 - 5x^2}\,dx$

Q.5 : Find the interior angles of a quadrilateral whose vertices are A(5,2) , B(–2,3) ,C(–3 , –4) and D(4 , –5).

Q.6 : Find the distance between the parallel lines $12x + 5y - 6 = 0$ and $12x + 5y + 13 = 0$. Sketch the lines. Also find an equation of the parallel line midway between them.

Q.7 : Find $\frac{dy}{dx}$ when $y = (ln\, x)^{ln\, x}$

Q.8 : Find the value of **m** and **n** , so that the given function **f** is continuous at $\boldsymbol{x = 3}$.

$$f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ 9 - 2x & \text{if } x > 3 \end{cases}$$

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